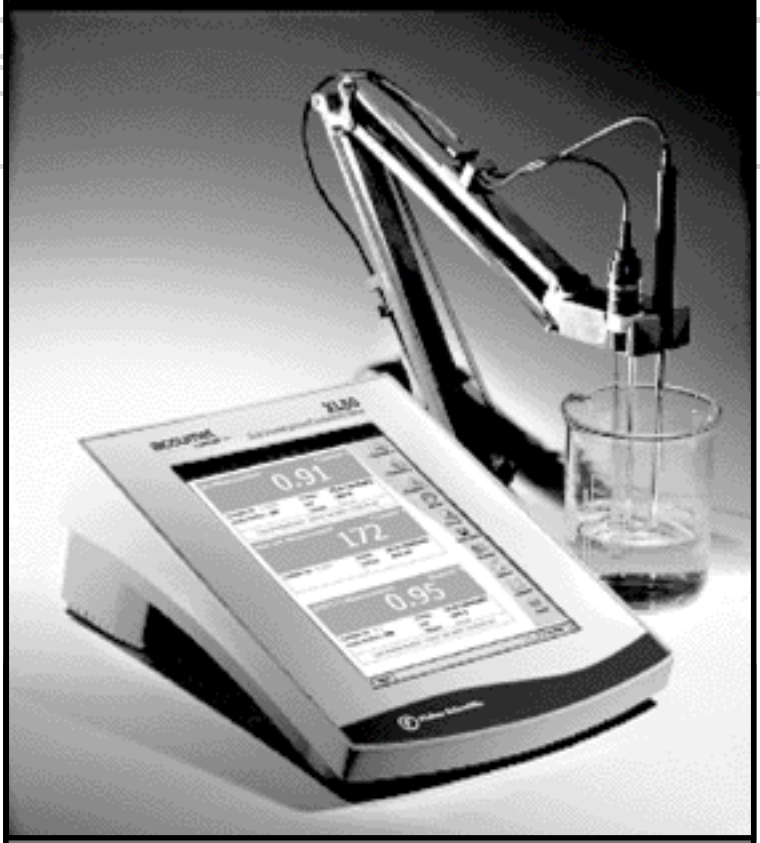
accumet®
excel

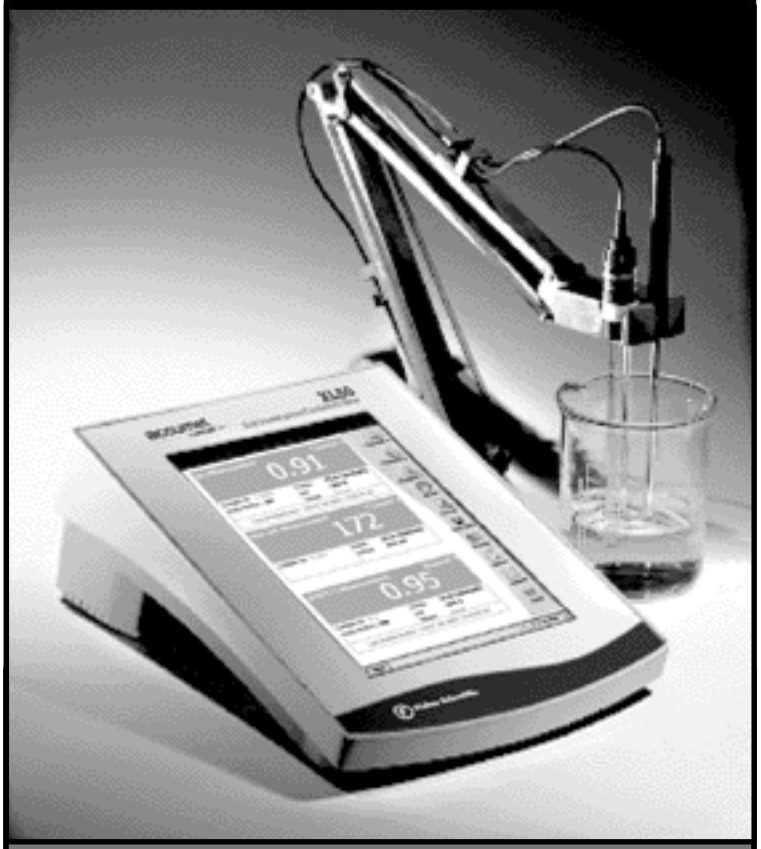
XL50



USER Manual

Fisher Scientific

XL50



USER Manual

Introduction 4

Unpacking the Meter 4

Specifications 5-6

Getting Started

CONNECTORS.....7
pH and Ion ELECTRODES 8-9
Conductivity CELLS 10

Using the Meter

TOUCH SCREEN OPERATION 11-12
Contrast adjustment 12
Using the STYLUS 13
Stylus Calibration.....13
Setting TIME and DATE 14
ON-SCREEN KEYBOARD 15
EXPANSION CARD 16
Connecting to the INTERNET 17
BUTTON FUNCTIONS 18-20
CHANNEL ASSIGNMENT 21
DISPLAY SETUP 22

pH Setup

pH SETUP SCREEN and Function Buttons 23
Access pH SETUP 24
Set SAMPLE ID# 25
Select BUFFER GROUP 26
Select BUFFER RECOGNITION.....27
Select AUTO READ MODE 27
Set pH STABILITY CRITERIA 28
Set DEFAULT TEMPERATURE 28
Set ISOPOTENTIAL POINT 29
Set ALARM LIMITS.....29
Set PRINT CRITERIA.....30
Set DATA STORAGE CRITERIA 31
Set DISPLAY CRITERIA SETUP.....32
View STORED DATA.....33-34

mV Setup

mV SETUP SCREEN and Function Buttons 35
Access mV SETUP 36
Set SAMPLE ID# 37
Set ALARM LIMITS.....38
Set PRINT CRITERIA SETUP 39
Set DATA STORAGE CRITERIA 40
Set DISPLAY CRITERIA 41
View STORED DATA.....42-43

Ion Setup

Ion SETUP SCREEN and Function Buttons 44
Access Ion SETUP 45
Set SAMPLE ID# 46
ION METHOD 47
Set ELECTRODE TYPE 48
Set MEASUREMENT UNITS 48
Set AUTO READ MODE.....49
Set ION STABILITY CRITERIA 49
Set DEFAULT TEMPERATURE.....50
Set TEMPERATURE COMPENSATION 51
Set Isopotential Point 51
Set ALARM LIMITS.....51
Set PRINT CRITERIA 52
Set DATA STORAGE CRITERIA 53
Set DISPLAY CRITERIA 54
View STORED DATA.....55-56

Conductivity Setup

Conductivity SETUP SCREEN and Function Buttons 57
Access Conductivity SETUP 58
Set SAMPLE ID# 59
Conductivity STANDARDS.....60
Select STANDARD RECOGNITION 60
Select STABLE indicator.....61
Select AUTO READ MODE 61
Select CELL CONSTANT 61
Set DEFAULT TEMPERATURE 62
Set REFERENCE TEMPERATURE.....62
Set TEMPERATURE COEFFICIENT 63
Set ALARM LIMITS 63
Set PRINT CRITERIA 64
Set DATA STORAGE CRITERIA 65
Set DISPLAY CRITERIA 66
View STORED DATA 67-68

Resistivity Setup

Resistivity SETUP SCREEN and Function Buttons 69
Access Resistivity SETUP 70
Set SAMPLE ID# 71
Set CALIBRATION POINTS 71
Select STABLE indicator.....71
Select AUTO READ MODE 71
Select CELL CONSTANT 72
Set DEFAULT TEMPERATURE 72
Set REFERENCE TEMPERATURE.....72
Set TEMPERATURE COEFFICIENT 72
Set ALARM LIMITS 73
Set PRINT CRITERIA 73
Set DATA STORAGE CRITERIA 74
Set DISPLAY CRITERIA.....74
View STORED DATA.....74

TDS (Total Dissolved Solids) Setup

TDS SETUP SCREEN and Function Buttons 75
Access TDS SETUP 76
Set SAMPLE ID# 77
Set CALIBRATION POINTS 77
Select STABLE indicator.....77
Select AUTO READ MODE 77
Select CELL CONSTANT 78
Set TDS FACTOR 78
Set DEFAULT TEMPERATURE 78
Set REFERENCE TEMPERATURE.....78
Set TEMPERATURE COEFFICIENT 79
Set ALARM LIMITS 79
Set PRINT CRITERIA 79
Set DATA STORAGE CRITERIA 80
Set DISPLAY CRITERIA.....80
View STORED DATA.....80

Salinity Setup
SALINITY SETUP SCREEN and Function Buttons 81
Access Salinity SETUP....82
Set SAMPLE ID# 83
Set CALIBRATION POINTS 83
Select STABLE indicator....83
Select AUTO READ MODE 83
Select CELL CONSTANT 84
Set DEFAULT TEMPERATURE 84
Set REFERENCE TEMPERATURE....84
Set TEMPERATURE COEFFICIENT 84
Set ALARM LIMITS 85
Set PRINT CRITERIA 85
Set DATA STORAGE CRITERIA 86
Set DISPLAY CRITERIA....86
View STORED DATA....86

pH Operation
About pH MEASUREMENT 87
STANDARDIZING 88-89
With Auto Buffer Recognition 88
With Manual Buffer Recognition 89
TEMPERATURE STANDARDATION 90
pH MEASUREMENT with Auto Read ON and OFF 91
GRAPHING FUNCTION 92

mV Operation
About mV MEASUREMENT 93
Absolute mV Measurement....94
Relative mV Standardization and Measurement 94
GRAPHING FUNCTION 95

Ion Operation
About Ion MEASUREMENT 96
DIRECT READING METHODS 97-100
Standardization: Direct Reading with Standards....97
Measurement: Direct Reading with Standards....98
Standardization: Direct Reading with Blank Offset 99
Measurement: Direct Reading with Blank Offset 100
INCREMENTAL METHODS 101-109
Standardization: All Incremental Methods 101
Measurement: Known Addition Method 102-103
Measurement: Known Subtraction Method 104-105
Measurement: Analate Addition Method 106-107
Measurement: Analate Subtraction Method 108-109
GRAPHING FUNCTION 110

Conductivity Operation
About Conductivity MEASUREMENT 111
STANDARDIZING 112-113
With Auto Buffer Recognition....112
With Manual Buffer Recognition....113
TEMPERATURE STANDARDATION....114
Conductivity MEASUREMENT 115
GRAPHING FUNCTION 116

Warranty....117
Compliance 117
Setting User Profiles 118-120

Appendix
Factory DEFAULT SETTINGS 121-122
Determining ISOPOTENTIAL POINTS EXPERIMENTALLY 123
pH THEORY....124-127
ISE THEORY....128-131
Replatinization 132
CONDUCTIVITY THEORY 133-135

Replacement Parts 136-137

Thank you for selecting a Fisher Scientific accumet meter. This manual describes the operation of the accumet XL50 meter. The state-of-the art meter that you have purchased runs on a Windows CE platform and has a similar framework of a pocket PC (or "Palm Pilot"). It is easy to operate and will guide you through the various functions by displaying easy to understand prompts. This operating manual should answer any questions that might arise in operating your meter; however, do not hesitate to call our accumet Technical Support Hotline at 1-888-358-4706, if you need any assistance.

This meter is designed to provide all the information necessary to guide you through the measurement process with a series of prompts on the screen. The accumet XL50 provides microprocessor precision in a compact benchtop design that is easy to use. One touch screen controls all procedures, letting you:

- Measure pH or pH (FET); absolute mV or relative mV; ion concentration; and conductivity, resistivity, Total Dissolved Solids (TDS), or salinity
- Select one of three sets of standard pH buffer groups
- Standardize with up to five pH standard or custom buffers; and with up to four conductivity standards
- Implement automatic pH buffer recognition or automatic conductivity standard recognition
- Select one of six ion standardization methods
- Customize your display screen and operating parameters
- Assign operator and sample identification numbers
- Specify ion selective electrode type
- Store 1000 data points per user in the meter's memory or transfer data to a computer or printer.
- Access extensive help with just a touch a button

Useful tips will appear in this box throughout this manual

It all adds up to rapid, completely automatic, intuitive operation.

Unpacking the Meter

The following is a listing of what you should have received with your new accumet XL50 pH/mV/Ion/Conductivity meter.

Meter with kit includes

- meter
- power supply
- electrode arm support bracket
- electrode arm
- pH electrode (13-620-130)
- Two-cell conductivity probe (13-620-100)
- ATC probe (13-620-19)
- manual and literature

Meter only includes

- meter
- power supply
- electrode arm support bracket
- electrode arm
- manual and literature

If any of these items are missing, please contact the accumet Technical Support Hotline at 1-888-358-4706. Accessory Conductivity Probes and Ion Selective Electrodes are available and can be ordered by calling Fisher Customer Service at 800/766-7000.

Accessory pH, ISE, and Conductivity probes are available and can be ordered by calling Fisher Customer Service at 800/766-7000.

Display

	640x480 digit LCD
screen size	4 1/2” x 6”
menu options	extensive
help screens	extensive
configurable display	yes
keypad controls	context specific touchscreen

Memory

	1000 data pts
internal diagnostics	yes
programmable data storage	store on stable, time, manual
programmable data output	timed or logged data
print interval	3 to 86400 sec
programmable alarm	yes

pH Mode

range	-2.000 to 20.000
resolution	0.1/0.01/0.001
relative accuracy	± 0.1/0.01/0.002 + 1 Lsd
automatic buffer recognition	yes
manual buffer recognition	yes
calibration points	5
auto lock	yes
FET	yes

mV Mode

range	± 2000.0
resolution	0.1
accuracy	± 0.2

Ion Mode

range	$1x10^{-6}$ to $9.99x10^{10}$
resolution	2 / 3 or 4 digits
relative accuracy	±0.17n%
calibration points	5
incremental methods	KA, KS, AA, AS

continued on next page

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Conductivity Mode

cell constants range	0.1, 1.0, 10
conductivity	0 to 500 mS/cm over 4 ranges 0 to 200.0 µS, 200.0 µS to 2.000 mS, 2.000 to 20.00 mS, 20.00 to 500.0 mS
resistivity	3 ohm-cm to 100 megohm-cm over 4 ranges 0 to 20.00 KOhms, 20.00 to 200.0 KOhms, 200.0 KOhms to 2.000 MOhms, 2.000 to 100.0 MOhms
Total Dissolved Solids (TDS)	0.0 to 500.0 ppt over 4 ranges (depending on the TDS factor) 0 to 200.0 x TDS factor ppm, 200.0 x TDS factor to 2000 x TDS factor ppm, 2.000 x TDS factor to 20.00 x TDS factor ppt, 20.00 x TDS factor to 500.0 x TDS factor ppt
salinity	0 to 90 ppt over 4 ranges 0 to 0.094 ppt, 0.094 to 1.000 ppt, 1.000 to 11.50 ppt, 11.50 to 90.00 ppt
accuracy	0.5% of full scale + 1 digit

Temperature Mode

range	-5.0 to +105.0 °C
resolution	0.1 °C
accuracy	± 0.2 °C

General

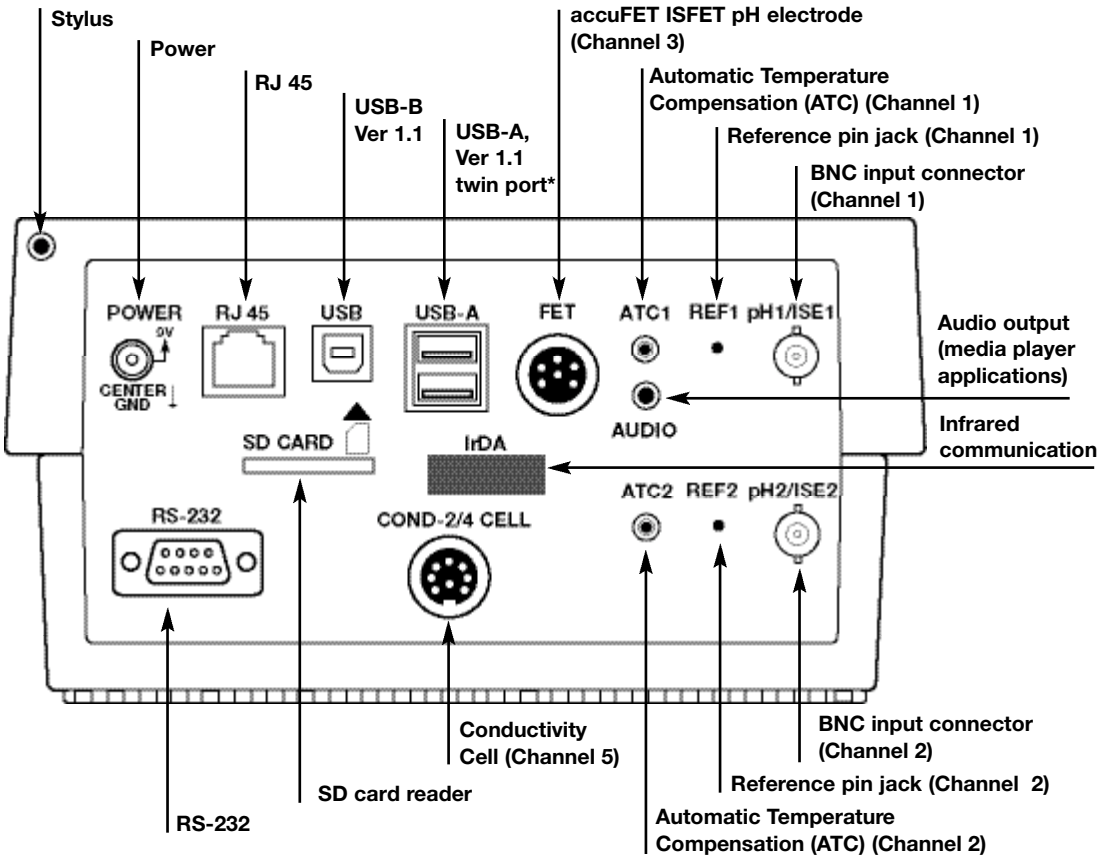
inputs/outputs	BNC, Pin, ATC, DIN (for FET), DIN (for conductivity)
electrical requirements	115 V/60 Hz, 230 V/50 Hz
output from PSU	9VDC, 3.3A center negative
line voltage tolerance	± 10%
input impedance	$>10^{12}$ ohms
meter size	6.75"x9.25"x3.5"
meter weight	2.8 lb.

Operating Conditions

operating temperature	5-45 °C
operation humidity	5-80 % noncondensing
maximum operating altitude	2000m
installation category	II
Pollution category degree	2

Fisher Scientific

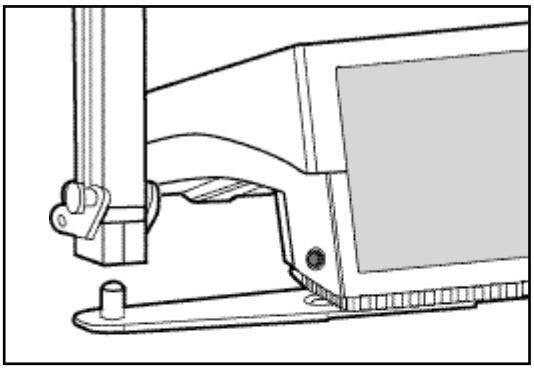
1 Review the layout and arrangement of the rear connector panel.



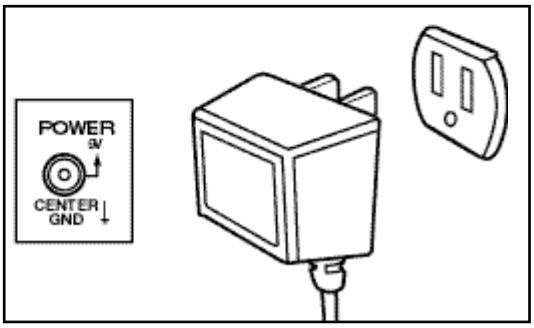
***NOTE: USB devices like printer, mouse, etc. should be connected to the lower port (USB-A).**

2 Connect the electrode arm to the base.

Electrode base can be attached to either side of meter. Purchase additonal arm with base (13-637-671) to use both sides.



3 Connect the power cable to the rear connector panel power jack and to a power source.

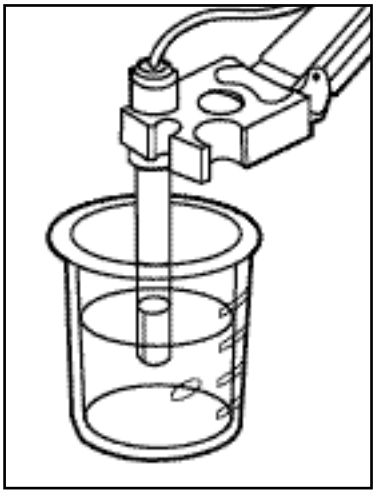


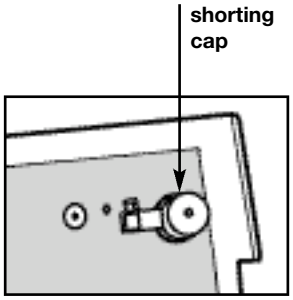
This meter allows you to use two types of pH electrodes: the conventional glass pH electrode and the AccuFET field effect transistor (FET) pH electrode. This meter also allows you to use ion specific electrodes.

1

Carefully remove the protective cover from the end of the electrode. Before first using your glass pH electrode, or whenever the electrode is dry, soak it 2-4 hours in an electrode storage solution, pH 4 Buffer, or KCl solution.

Before using your ion specific electrode, consult the manufacturer's instructions for electrode preparation.





Do not discard the BNC shorting cap.

2

Remove the shorting cap on BNC connector. Connect the combination pH electrode by plugging it into the BNC input connector (twisting to lock in place).

If a combination electrode isn't used, connect the indicating pH electrode into the BNC input connector. Plug the reference electrode into the reference pin jack. Also, install the ATC probe into the ATC jack.

Note: Be sure to connect all probes to the appropriate channel connectors (for example: Input 1, Ref 1 and ATC1).

Option: Connect the optional AccuFET electrode by plugging it into the FET jack on the back meter panel. Allow the AccuFET to warm up five minutes before use.

Connect ion specific electrodes in the same manner as pH electrodes.

If both a conventional electrode and an AccuFET electrode are connected to the meter, do not put them in a solution together because you will get inaccurate measurements.

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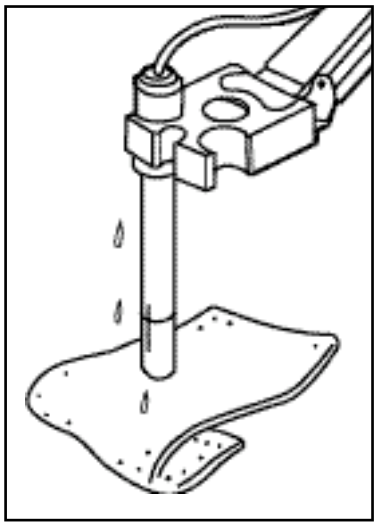
3

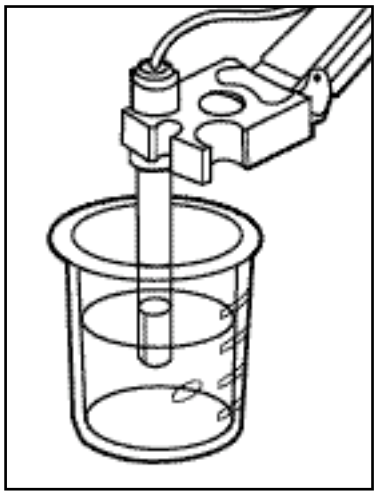
Rinse and blot-dry (don't wipe) electrodes between each measurement. Rinse electrodes with distilled or deionized water, or a portion of the next solution to be measured.



4

Between measurements, store conventional pH electrodes in electrode storage solution, pH 4 buffer, or KCl solution. Refill when the level of solution gets below the manufacturer's recommended level.

Store ion specific electrodes according to electrode manufacturer's recommendations.

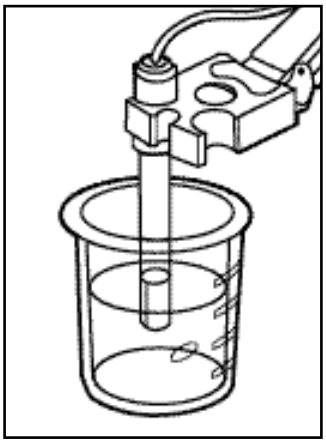


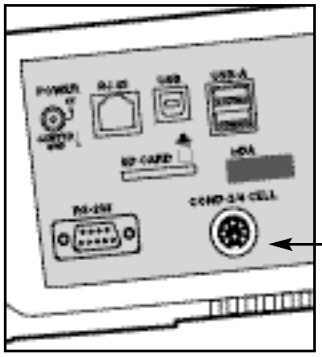
Proper electrode care is fundamental to obtaining reliable pH measurements. Improper care of the electrode may cause the meter reading to drift, respond slowly, or produce erroneous readings. For this reason, the electrode should always be conditioned and used in accordance with manufacturer's instructions.

This meter allows you to use two types of conductivity cells: the 2-cell conductivity cell and the 4-cell conductivity cell with DIN connector. Only one type of conductivity cell can be connected at a time.

1

Carefully remove the protective cover from the end of the conductivity cell. Before using your conductivity cell, soak it for 5 to 10 minutes in distilled or deionized water.



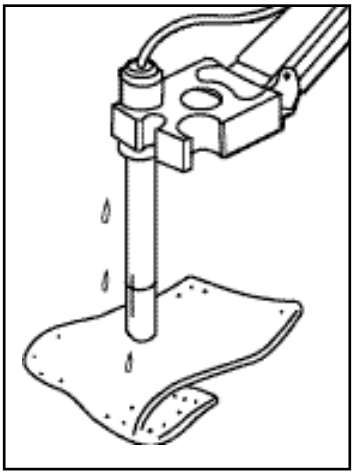


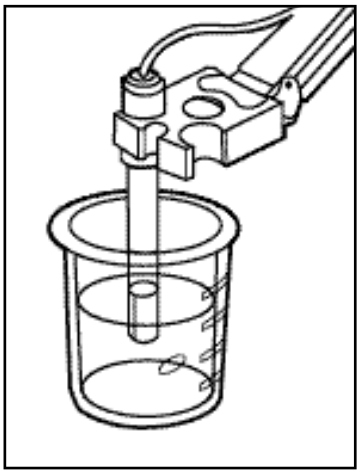
2

Connect the **2-cell** or **4-cell conductivity cell** to the conductivity cell jack. The 2-cell and 4-cell accumet conductivity cells have built in ATC probes. Therefore, there is no need to connect a separate ATC probe.

3

Rinse and blot-dry (don't wipe) probe between each measurement. Rinse probe with distilled or deionized water, or a portion of the next solution to be measured.





4

Between measurements, conductivity probes can be stored dry.

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When the meter is turned on it first goes though self test, displays the FISHER Catalog cover, briefly displays the desktop screen (**Home**) before loading the XL50 program which results in the display of the measurement screen.

Desktop screen (Home)

pH, mV, and pH (FET) triple measurement screen

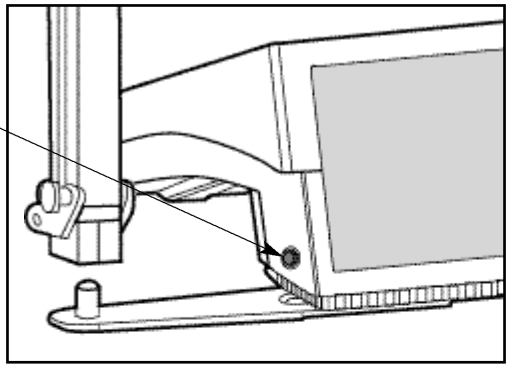
The new accumet XL50 benchtop meter operates with a state-of-the-art touch screen. The touch screen makes this the easiest meter on the market to operate and care for. When the meter is first plugged in, the meter runs a self-test and takes you to the measurement screen. Touch any icon to access the functions of the meter. Your XL50 meter also includes a stylus that you can use to tap on your screen. The stylus easily stores inside the back panel of the meter.

The buttons on the right side of the screen control all of the functions of the meter. A light touch on the screen is all that you need to access the various functions. Once you touch a button you will get an audible tone; **the screen will not change until you lift your stylus**. This design prevents rapid uncontrolled scrolling through the various function screens.

Function buttons and options change from screen to screen. Easy to understand prompts guide you through the operation of the meter in the selected mode. If you are ever in doubt about what to do, just touch **Help** on the bottom right corner of the screen for detailed information about that screen.

Your meter was shipped with a clear protective sheet to protect the LCD display and "bubbles" may appear on the screen. The screen will respond better and visibility will improve if it is removed. Alternatively, you may choose to leave this on for added protection.

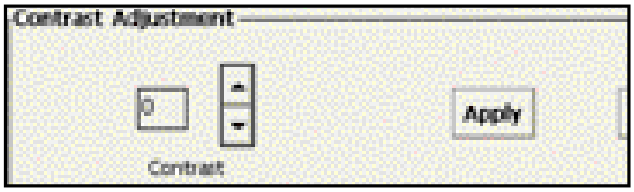
NOTE: To turn off the display without removing the power cord, simply press the black button on the back right of the meter. Press again to turn display on.



Screen contrast adjustment

You can adjust the contrast of your screen to your requirements.

1. From the **HOME** screen, tap the bottom left of the screen to access the Start menu. Tap **Start > Settings > Control Panel**. This launches the **Control Panel** screen.
2. Tap the **Display Contrast** icon twice.
3. Use the up and down arrows to select your desired contrast.
4. Tap the **Apply** key to view your adjusted contrast. Tap the **Close** key to shut the window.



Your XL50 Meter comes with a stylus that you should use to tap on your screen. The stylus easily stores inside the back panel of the meter.

You can perform two basic actions using the stylus:

Tap
Lightly touch the screen to select or open an item. Lift the stylus after you tap an item. Tapping is equivalent to clicking an item with the mouse on your personal computer. **Note:** Some program items require a double tap to select or launch. Double tap on the icons from the Desktop (**Home**) page and single click in the XL50 application.

Drag
Place the point of the stylus on the screen and drag an item across the screen without lifting the stylus until you have completed the selection. Dragging is equivalent to dragging with the left mouse button pressed on your personal computer .

Stylus Calibration
If your insturment is not responding properly to your taps, you may need to recalibrate your screen.

1. From the **HOME** screen, tap the bottom left of the screen to access the Start menu. Tap **Start > Settings > Control Panel**. This launches the **Control Panel** screen.
2. Tap the **Stylus** icon twice.
3. Tap the **Calibration** button to access the calibration screen.
4. Tap the **Recalibrate** button.
5. Carefully press and briefly hold the stylus on the center of the target. Repeat as the target moves around the screen. If you miss the target center, keep the stylus on the screen, slide it over the target's center, and then lift the stylus.
6. Once the calibration is complete, the target cursor will disappear. Tap anywhere in the screen to go back to the "Stylus Properties" window. Tap **OK** to close the "Stylus Properties" window.

CAUTION: To prevent damage to your XL50 screen, never use any device other than the stylus that comes with the meter or an approved replacement to tap on the screen. Order extra or replacements if you lose or break your stylus.

Setting the Time

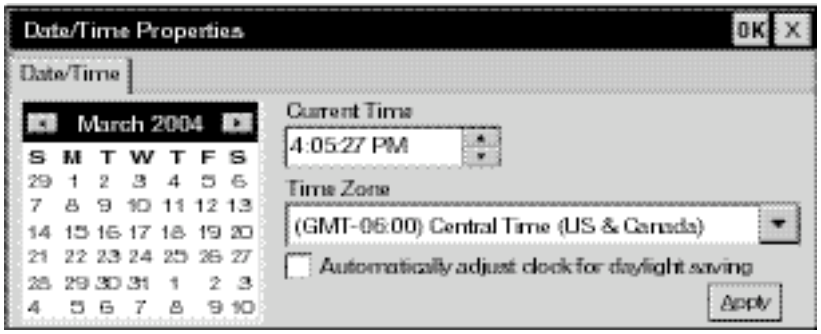
1. From the **HOME** screen tap the bottom left of the screen to access the Start menu. Tap **Start > Settings > Control Panel**. This launches the **Control Panel** screen.
2. Double tap **Date/Time** icon. This launches the **Date/Time Properties** window.
3. Tap the time-zone down arrow, and select the appropriate time zone.
4. Tap the hour, minutes, or seconds. Use up and down arrows to adjust.
5. Tap AM or PM. Use up and down arrow to select.
6. Tap **Apply** button.
7. Tap **OK** to save the time.

Setting the Date

1. From the **HOME** screen tap the bottom left of the screen to access the Start menu. Tap **Start > Settings > Control Panel**. This launches the **Control Panel** screen.
2. Double tap **Date/Time** icon. This launches the **Date/Time Properties** window.
3. Tap the left or right arrow to select a month and year.
4. Tap a day.
5. Tap **Apply** button.
6. Tap **OK** to save the time.

You need to reset your time zone, time, and date if:

- The time changes or you are traveling to a different time zone.


Date/Time Properties
OK
X
Date/Time
March 2004
S M T W T F S
29 1 2 3 4 5 6
7 8 9 10 11 12 13
14 15 16 17 18 19 20
21 22 23 24 25 26 27
28 29 30 31 1 2 3
4 5 6 7 8 9 10
Current Time
4:05:27 PM
Time Zone
(GMT-06:00) Central Time (US & Canada)
Automatically adjust clock for daylight saving
Apply

The time on the meter can be synchronized with your personal computer through Microsoft® "Active sync".

Using the On-Screen Keyboard

Use the stylus to tap letters, numbers, and symbols on the on-screen keyboard to enter typed text directly onto the screen.

1. From any application, screen tap the bottom right of the screen to access the input panel. Tap the **Pencil/Keyboard** icon (see below). A pop-up menu will appear.
2. Tap **LargeKB** to display a large keyboard with all function keys. Tap **keyboard** for a basic function alphanumeric keyboard.
3. Tap desired letters, numbers and symbols on the keyboard. Hit the enter key.
4. To remove keyboard, tap on **Pencil** icon. The pop-up menu will appear. Tap **Hide Input Panel** to remove keyboard.

To see symbols, tap the **Shift** key.

Expansion Cards

You can expand the memory and connectivity of your XL50 meter.

Use optional expansion cards for:

- Expanding the memory of your XL50 meter
- Viewing the content of memory cards

> Expansion cards must be purchased separately and are not included with your XL50 meter

Installing an Expansion Card

To install a Secure Digital (SD) card into an expansion slot on the XL50 meter:

1. Locate the slot on the top of XL50 meter.
2. Remove the protective plastic card.
3. Insert the expansion card into the expansion slot and push the connection edge of the card firmly into the expansion slot.

> If your expansion card is not recognized, follow the card manufacturer's instructions to install it.

Removing a Secure Digital (SD) Expansion Card

1. Close all applications that are using the expansion card.
2. Remove a card from the Secure Digital expansion slot by **slightly pushing down on the card** to unlock it.
3. When the card disengages and pops up, pull it from the expansion slot.

> **CAUTION:** SD cards must first be unlocked before removal.

Viewing the Content of Memory Cards

Use File Explorer to view the files that are located on your optional Secure Digital card.

1. From the **Start** menu, tap **Programs > File Explorer**.
2. Tap the root directory of **My Device**, and select the Storage Card folder (SDIO) to see a list of files and folders.

Entering an Internet Address

With Pocket Internet Explorer and a connection to the Internet, you can view Web sites on your XL50 meter by typing an address or Universal Resource Locator (URL) in the **Address** bar. Web sites that use HTML 4.0, DHTML, animated GIF images, and Java applets may not work correctly in Pocket Internet Explorer without additional software.

To enter an Internet address (URL) on your XL50 meter:

1. From the **Start** menu, tap **Programs > Internet Explorer > Address Bar**. If the Address Bar is not visible, tap the **View** tab **> Address Bar** to turn it on. You may also double tap the **Internet Explorer** icon on the **Home** screen to launch Internet Explorer.
2. Enter the Internet address (URL) in the Address bar using the on-screen keyboard.
3. Tap the **Go** icon.

Using a Favorites List

With Pocket Internet Explorer and a connection to the Internet, you can view Web sites on your XL50 meter by selecting one from your Favorites list.

To select a Web site from your **Favorites** list:

1. From the Start menu, tap **Internet Explorer**.
2. Tap the **Favorites** icon and the Web site you want to view.

The touch screen of your XL50 bench meter has “buttons” along the right side of the screen that are common to many of the screens. The following indicates the function of these common buttons.

Channel 1

Channel 2

Channel 3

Channel 5

The **Channel 1, Channel 2, Channel 3 and Channel 5** buttons access the single display screen corresponding to each channel. If you wish to perform standardization or printing from any of the channels, you need to use single channel mode. The Graph can only be viewed in the single channel mode.

Mode

The **Mode** button allows you to switch between the various operations of the meter—pH, mV, ion, pH (FET), conductivity, resistivity, TDS and salinity. It also lets you configure the display options, select input parameters, and view the software revision and serial number details.

Setup

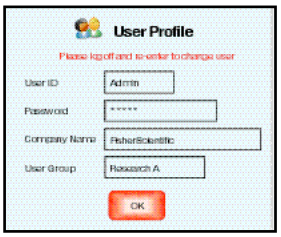
The **Setup** button will access the setup screens of the measuring mode that you are currently using.

Log Data

The **Log Data** button sends data to the data storage center of the meter if a sample ID# has been assigned to your sample.

Profile

The **Profile** button lets you view your profile (User ID, Password, Company Name, User Group) You can change only your profile and not of any other user. You can change to a different user only if you are the default user of the system.



Home

The **Home** button accesses the Windows CE desktop. The XL50 application does not shut down if Home is pressed and the current user remains logged in. Double tap on the XL50 icon to return to the previous screen before the Home button was pressed.

Logoff

The **Logoff** button allows you to logoff the current user from the XL50 application. The XL50 application shuts down returning to the Win CE desktop. When you re-start the application, you go to the main screen of the application. The second time you are logged in as the default user of the system.

Help

The **Help** button allows you to access helpful information on any screen. Touching the Help button gives you information about the current screen. This information will include step-by-step instructions for operating the meter from the current screen and possible applications information for that screen.

The following buttons appear in the Mode screen:

Replatinization is the process of replacing the platinum on the surfaces of the 2 cell conductivity probes that may flake or wear off over time. The platinum on the surface of the probe is used to increase the surface area of the measuring surface resulting in decreased polarization error. Replatinization is a relatively quick procedure to perform, taking no more than 5 minutes. See Appendix page 132 for procedure.

The **About** button lets youview the software revision and serial number details.

The **Sys.Setup** button allow you to turn on or off the beep status. This is the audible beep that sounds each time any button is touched.

The **Multi Channel** button lets you view multiple channels at the same time. By default, the meter will display three channels: Ch1 in the upper display (Display 1), Ch2 in the middle display (Display 2), and Ch5 in the lower display (Display 3).

The **Display Setup** button lets you configure the display to read the inputs from channels of your choice. The XL50 meter has four input channels and offers a maximum of three simultaneous displays.

*The following buttons appear in the mode screen after **Ch1**, 2, 3, or 5 is selected:*

The **pH** mode button allows you to switch to the various pH operations of the meter (available in Channels 1 and 2).

The **mV** mode button allows you to switch to the various mV operations of the meter (available in Channels 1 and 2).

The **Ion** mode button allows you to switch to the various ion concentration operations of the meter (available in Channels 1 and 2).

The **pH (FET)** mode button allows you to switch to the various pH (FET) operations of the meter (available in Channel 3 only).

The **Conductivity** mode button allows you to switch to the various conductivity operations of the meter. (available in Channel 5).

The **Resistivity** mode button allows you to switch to the various resistivity operations of the meter. (available in Channel 5).

The **TDS** mode button allows you to switch to the various TDS operations of the meter. (available in Channel 5).

The **Salinity** mode button allows you to switch to the various salinity operations of the meter. (available in Channel 5).

The following buttons appear in all single channel screens:

Print

The **Print** button will send information to the output device that is connected to your meter. If you selected the "Log data" option in the "Print criteria" setup, clicking on the print button will dump the logged data to the printer.

Standardize

The **Standardize** button accesses the standardization screen from the various measure modes and initiates standardization of the meter once the standardization screen is accessed.

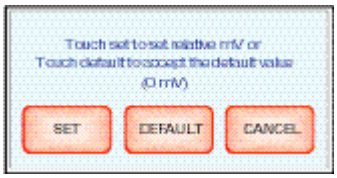
Measure

The **Measure** button directs the meter to measure your sample when in the Auto Read function of the pH, ion, or pH (FET) modes.

The following buttons appear in the mV single channel screen:

rel mV

The **rel mV** button returns the meter into the relative millivolt mode when in the absolute mV mode. When this mode is activated, a window will appear asking you to set a relative mV value or accept the default value of 0 mV. This feature may assist the user to standardize certain analytical and monitoring activities such as titration.



abs mV

The **abs mV** button returns the meter to absolute millivolt mode when the meter is in the relative mV mode. This button only appears when the meter is in the relative mV mode

The following buttons appear in all standardization screens:

Confirm

The **Confirm** button accepts current value of the buffer or standard solution.

Clear

The **Clear** button clears all previous standardization points.

Cancel

The **Cancel** button cancels current standardization and returns to the measurement screen..

Temp Std

The **Temp Std** button allow you to check the accuracy of your temperature probe and standardize to an accurate thermometer.

The XL50 features four channels.

Channels 1 and 2 can be set for a pH or mV electrode with a BNC connector.

Channel 3 can be set for a pH (FET) electrode.

Channel 5 can be set for a 2-cell conductivity cell or a 4-cell conductivity cell with a DIN connector.

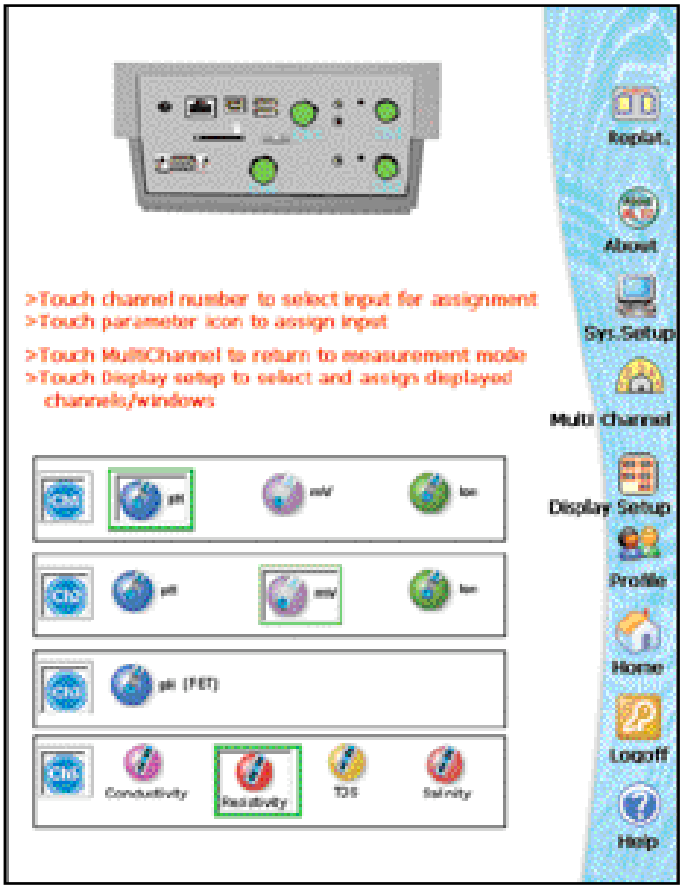
The XL50 features a triple, dual or single display mode. In triple display mode, the display is split into thirds to show three channels of your choice simultaneously. In dual display mode, the display is split into two halves to show two channels of your choice simultaneously. The parameters displayed are based on the Display Setup (see page 22 for directions).

Assigning the channels

1. Touch the **Mode** button on the Measure screen.
2. Touch a **Channel** button (Ch1, Ch2, Ch3, or Ch5) to select the parameter assigned to that channel.
3. Touch the appropriate parameter icon to the right of the channel to assign an input to each desired channel.
4. To deselect a channel, simply touch the the **Channel** button again.

If multiple channels are assigned, touch the Display Setup button to select and assign displayed windows (see page 22 for directions).

To return to measurement mode, touch Multi Channel (if two, three, or four channels are assigned) or touch Single Channel (if one channel is assigned).



Display Setup lets you select which channel will appear in each display. You can allocate up to three of the four parameters to up to three displays. Access the Display Setup button from the Mode screen when multiple channels are selected.

To configure the display:

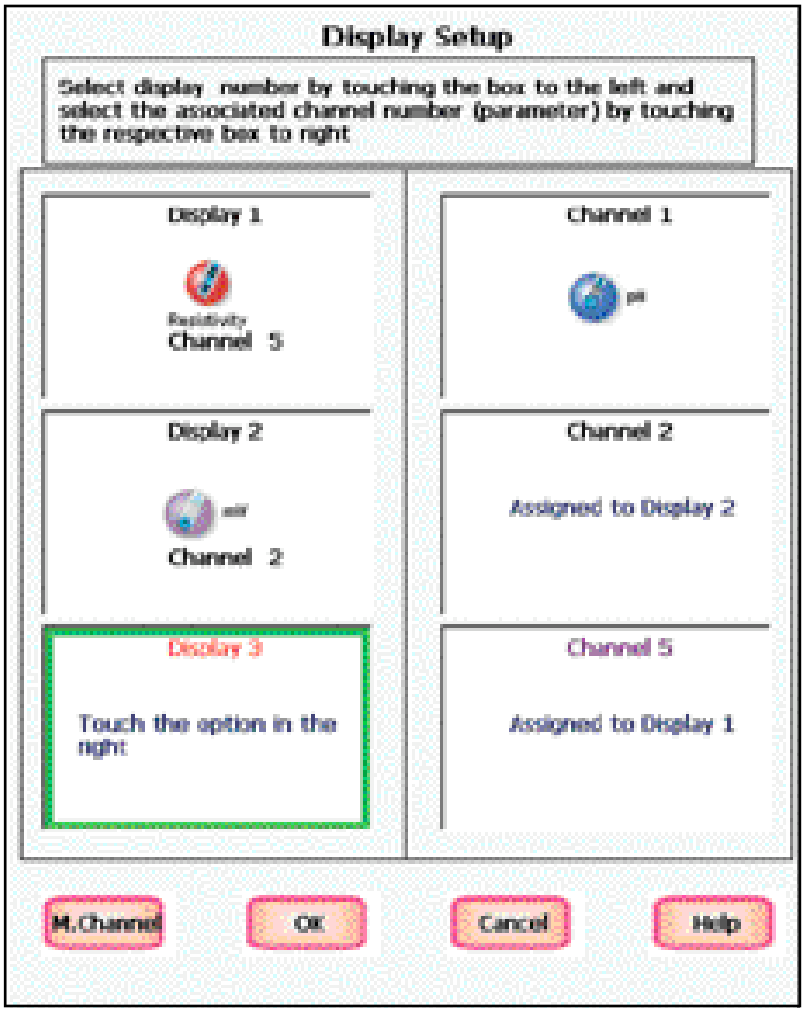
1. Touch the desired **Display** box (Display 1, 2, or 3).
2. Touch any one of the three **Channel** boxes to the right of the display box to assign the channel to the selected display.
3. To reassign any of the displays, touch the Display box again and the allocation clears.

Touch the **M. Channel** button to save the configuration and return directly to the Measurement screen.

Touch the **OK** button to save the display configuration and return to the Mode screen.

Touch the **Cancel** button to exit and return to the Mode screen without saving changes.

When you touch the **Help** button, information about the current screen appears. This information includes step-by-step instructions for operating the meter from the current screen and possible applications information for that screen.



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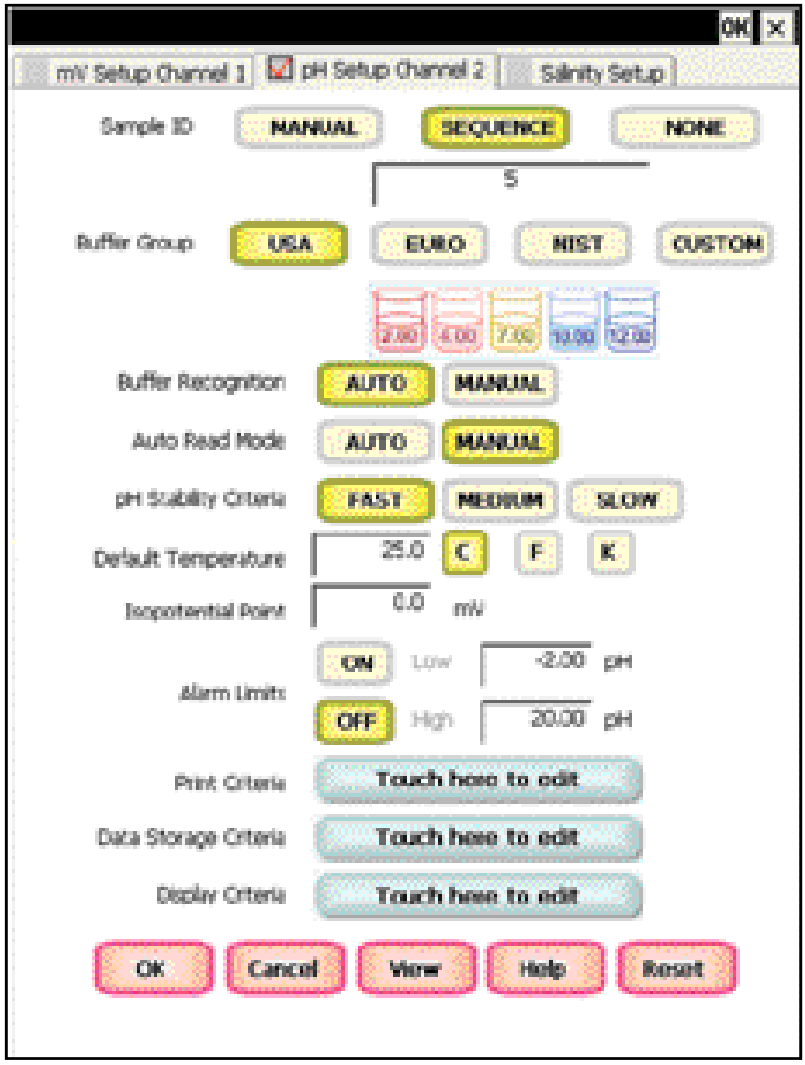
The pH Setup screen presents many options to control the pH operating parameters of the meter. The meter is factory set with regard to these options, and is ready for use under most circumstances (see appendix page 121 for default settings). The pH Setup section will guide you through the various options available in the pH setup mode.



Function Buttons on pH Setup Screen

Touch **OK** to confirm pH Setup and return to the pH Measure screen.

Touch **Cancel** to exit and return to the pH Measure screen without confirming pH Setup.

Touch **View** to view all pH data points stored in memory. See pages 33-34 for details.

When you touch the **Help** button, information about the current screen appears. This information includes step-by-step instructions for operating the meter from the current screen and possible applications information for that screen.

Touch **Reset** to reset all pH Setup Criteria to the factory default.

To access the Setup screen:

1. Make sure you are in the pH Measure screen (either multiple display or single display; see page 22).
2. Touch the **Setup** button to access the pH Setup screen.

If you were in triple or dual display mode, you have access to the Setup mode for each channel displayed. Touch the **Setup Channel** buttons at the top of the screen to toggle back and forth between the setup screens for each channel. To change pH parameters, select the pH Setup button.

If you were in single display mode, you will access the Setup mode for the single channel displayed only.

See page 23 for pH setup directions.

See page 35 for mV setup directions.

See page 44 for ion concentration setup directions.

See page 57 for conductivity setup directions.

A sample ID is required if you wish to log data or do a timed printing. Whenever this option is active, each time you touch **Log Data** (available on the single display pH Measure screen), the pH (or pH FET) value along with date/time/channel and the sample ID will be sent to data storage.

You can manually enter an alphanumeric identification number of 10 characters for any sample or you can have the meter sequentially number your samples beginning at the number of your choice. You can also choose to deactivate the sample ID.

To set sample ID — Manual:

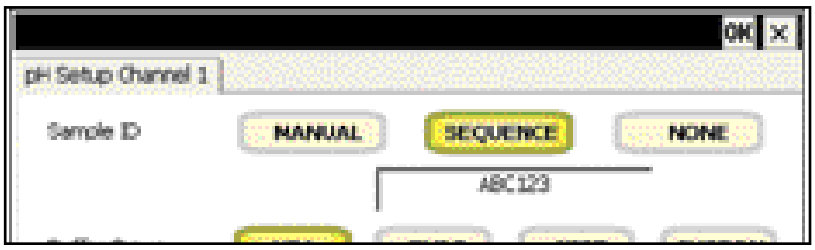
1. Touch **Manual** for manual Sample ID entry
2. The current ID is displayed on the screen
3. Use the alphanumeric keypad on the screen to enter the desired Sample ID. The **BS** key will allow you to backspace to remove a character that was incorrectly entered.
4. Touch **Enter** to accept current Sample ID and return to the pH (or pH FET) Setup screen.

To set sample ID — Sequential

1. Touch **Sequential** for sequential Sample ID entry
2. The current ID is displayed on the screen
3. Use the numeric keypad on the screen to enter the desired Sample ID number that you would like your sequential Sample ID assignment to begin with. Every time you touch **Print** or **Log Data** on the pH Measure screen, the Sample ID will increase by 1. The **BS** key will allow you to backspace to remove a character that was incorrectly entered.
4. Touch **Enter** to accept the first sequential Sample ID and return to the pH (pH FET) Setup screen.

To deactivate the sample ID assignment — None

1. Touch **None** to deactivate the sample ID assignment



This setup option allows you to select from 3 different buffer groups, for auto buffer recognition. Or you can create a custom group of buffers for auto buffer recognition by touching custom.

The 3 existing buffer groups are :

USA buffers: 2.00, 4.00, 7.00, 10.00, 12.00

European buffers: 1.00, 3.00, 6.00, 8.00, 10.00, 13.00

NIST buffers: 1.68, 4, 6.86, 9.18, 12.45

To select buffer group

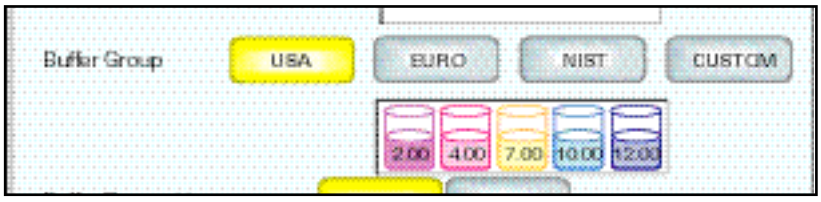
1. Touch **USA**, **EURO**, **NIST** or **CUSTOM** from the setup screen to select a buffer group.

To set Custom pH buffer group

This option allows you to create a custom buffer group of up to 5 buffers (2 buffer minimum) to be used for auto buffer recognition. To obtain optimal results, it is important to maintain at least 1 pH unit between selected buffers in the custom group.

1. Touch **CUSTOM** on the setup screen to select a custom buffer. This will display a set of 5 custom beakers each initialized to zero.

2. Touch one of the beakers to display the numeric keypad.
3. Enter a value for the custom pH buffer that you want set in your custom buffer set.
4. Press **Enter** in the keypad to accept the value.
5. Repeat steps ***2*** through ***4*** until all 5 custom buffer beakers are populated with desired values.
6. To modify the value entered, touch the particular beaker and key in the new value using keypad.
7. To clear all custom buffer values, touch **CLEAR**.



Select Buffer Recognition

This option allows you to select Automatic buffer recognition or manual buffer recognition when standardizing. With the automatic buffer recognition activated, the meter will automatically recognize the buffers from the chosen buffer group and accept them when the meter recognizes the reading as stable. When in the Manual buffer recognition mode, you must enter the buffer value during the standardization procedure. The meter will accept the manually entered buffer when you recognize that the measurement is stable. During the standardization procedure, you may accept the buffer value before the meter recognizes it as stable by touching the **Standardization** button.

To select Buffer Recognition

1. Touch **MANUAL** or **AUTO** to choose the method of buffer selection

Select Auto Read Mode

You can use this meter when the Auto Read function is active or when it is inactive. When the Auto Read function is active, the meter will lock onto a reading when the meter recognizes it as stable. The meter will not deviate from this reading until Measure is touched. If the Auto Read function is inactive, then the meter will continuously monitor the pH of the sample and the Measure screen display will indicate any fluctuation in the sample pH.

To select Auto Read Mode

1. Touch **MANUAL** or **AUTO** to choose the desired read mode.

Set pH Stability Criteria

This setup screen allows you to determine how quickly the meter will respond to electrode drift. There are three speed settings: fast, medium and slow

To set pH Stability Criteria

1. Touch **FAST**, **MEDIUM**, **SLOW** to choose the desired stability criteria.

> Stability criteria are more stringent at the slower setting. Therefore, if the highest precision is required, then a slow setting would be desired. The default setting is the **FAST** and this should be adequate for the majority of applications. without making any changes.

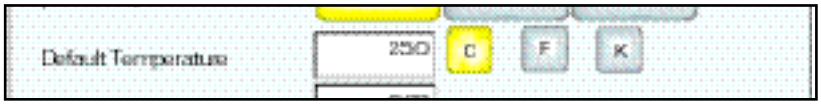
Set Default Temperature

It is a well known fact that pH is a temperature dependent measurement. The factory default setting is 25°C. If you are measuring the pH of a solution that is not 25°C and you are not using an Automatic Temperature Compensation (ATC) probe, then you should enter the temperature value of that solution in order to get the correct pH value. The current default temperature setting will be displayed on the screen.

The default temperature can be set from -5°C to 105°C.

To set Default Temperature

1. Select temperature units by touching the appropriate unit button: **C** (Celsius), **F** (Fahrenheit) or **K** (Kelvin)
2. Touch the **Default Temperature box** and use the numeric keypad to enter the desired default temperature (-5°C to 105°C).
3. Press **Enter** in the keypad to return to pH (pH FET) Setup screen



> The use of an ATC probe provides a measured temperature value to the meter and will override any value entered in the default temperature screen. This measured value will be used by the meter to make pH calculations.

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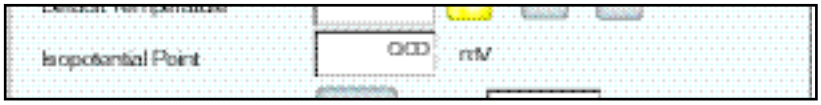
Set Isopotential Point

The isopotential point is the millivolt reading for an electrode at which temperature has no effect on the measurement. pH electrodes are constructed so that the isopotential point is theoretically zero millivolts. This is very close to a pH of 7. Most pH electrodes do not achieve this value precisely. However they are close enough so that it is not usually necessary to use an isopotential point other than zero. The true isopotential point of any given electrode must be determined experimentally.
(See Appendix: Determining Isopotential Points Experimentally, page 58)

The isopotential point can be set from -100 to +100

To set Isopotential Point

1. Touch the **Isopotential Point box** and use the numeric keypad to enter the desired mV setting for the new isopotential point.
2. Touch **Enter** to accept this value and return to pH (pH FET) Setup screen.



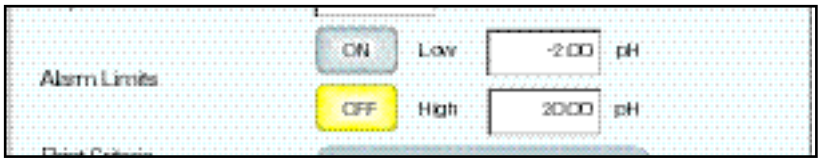
Set Alarm Limits

This option allows you to set alarm limits for the pH measuring mode. If the pH value of the measurement is outside of the boundaries set by the minimum and maximum limits, audible and visual warnings will let you know that your sample measurement was outside of the set limits.

The Alarm Limit can be set from -2 pH to 20 pH

To set Alarm Limits

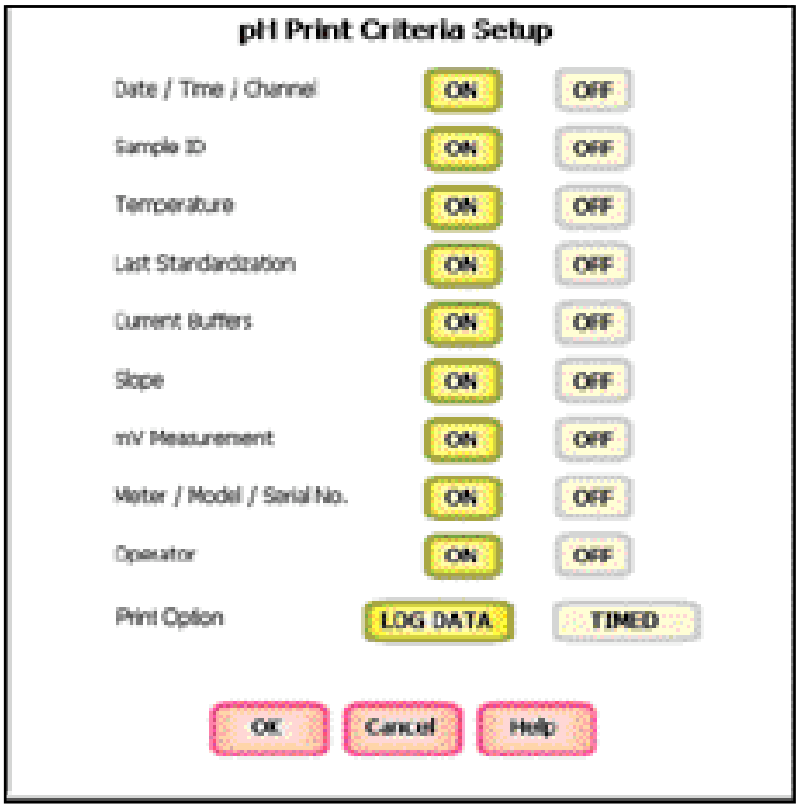
1. Touch **ON** or **OFF** to set the status of the alarm of pH (pH FET) mode
2. Touch the **Low box** and use keypad to enter the new limit values.
3. Touch **Enter** on the keypad to accept this limit and return to the pH (pH FET) Setup screen.
4. Touch the **High box** and use keypad to enter the new limit values.
5. Touch **Enter** on the keypad to accept this limit and return to the pH (pH FET) Setup screen.



This screen allows you to select which criteria are printed with the measurement when you print the data. The status of the current print criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option. Any active criteria will be printed on demand.

To set Print Criteria

1. Touch the **Touch here to edit** button next to the Print Criteria to access the pH Print Criteria Setup screen.
2. Touch **ON** or **OFF** to change the status of a criteria you want to modify.
3. Repeat step **2** for all the remaining criteria except **Print Option**.
4. For Print Option select between **Log Data** and **Timed**. If “Log Data” is selected, clicking on the “Print” button from the Measurement screen will send the logged data to the printer. If “Timed” is selected, you can print data at an interval you select. This data is buffered and is sent to the printer when the page is full.
5. Touch **OK** button to accept the changes of the entire group of print criteria and return to the pH (pH FET) Setup screen.



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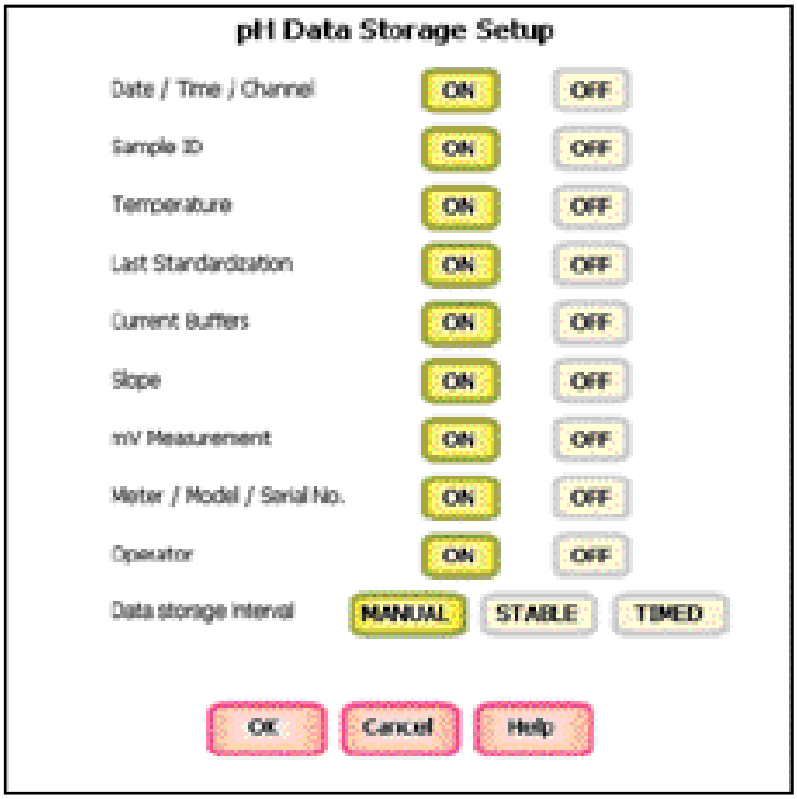
This screen allows you to select which criteria are stored in the data logger with the measurement when you store the data. The status of the current data storage criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option. Any active criteria will be stored on demand.

To set Data Storage Criteria

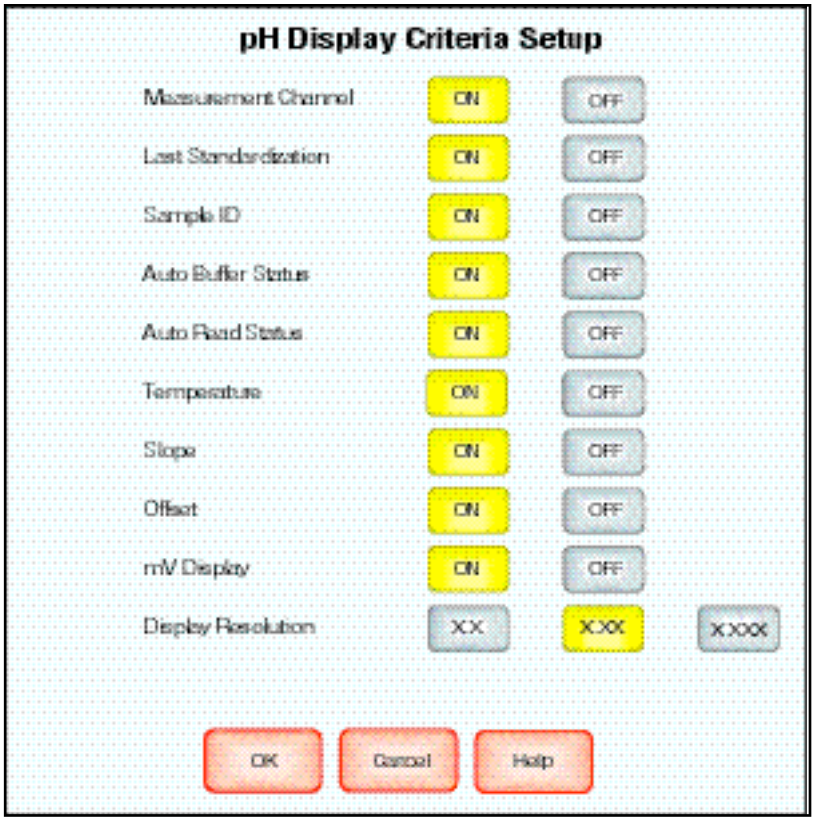
1. Touch the **Touch here to edit** button next to the Data Storage Criteria to access the pH Data Storage Setup screen.
2. Touch **ON** or **OFF** to change the status of a criteria you want to modify.
3. Repeat step **1** for all the remaining criteria except Data storage Interval.
4. For Data storage Interval, touch **MANUAL** to log pH data only when the Log Data button is pushed, touch **STABLE** to automatically log pH data when the pH reading is stable, or touch **TIMED** to set a specific timed interval in seconds to log pH data.
5. Touch the **OK** button to accept the changes of the entire group of data storage criteria and return to the pH (pH FET) Setup screen.



This screen allows you to choose what information you would like to be displayed on the pH Measure screen, particularly the information contained in the data box at the bottom of the Measurement screen. The status of the current display criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option.

To set Display Criteria

1. Touch the **Touch here to edit** button next to the Display Criteria to access the pH Display Criteria Setup screen.
2. Touch **ON** or **OFF** to change the status of a criteria you want to modify.
3. Repeat step **2** for all the remaining criteria except **Display Resolution**.
4. For Display Resolution, touch **X.X** to display pH with one decimal place, touch **X.XX** to display pH with two decimal places, or touch **X.XXX** to display pH with three decimal places.
3. Touch **OK** button to accept the changes of the entire group of display criteria and return to the pH (pH FET) Setup screen.



The XL50 has a memory capacity to store up to 1000 data points. The View Stored Data screen allows you to look at specific data points stored in the meter based on the meters memory capacity.

The meter stores pH or pH (FET) data under the following parameters:

Reading	Last Standardizations
Operator	Current Buffers
Date / Time / Channel	Slope
Sample Id	mV Measurement
Temperature	Meter Model Serial No.

To View Stored Data

1. Touch the **View** button in the pH Setup screen

You can only log 1000 data points at a time. To clear space for new data points, you have to delete the same number of old data points as you want to add new data points.

Function buttons on View Stored Data Screen

Touch **OK** to go back to the pH Setup screen from the View Stored Data screen.

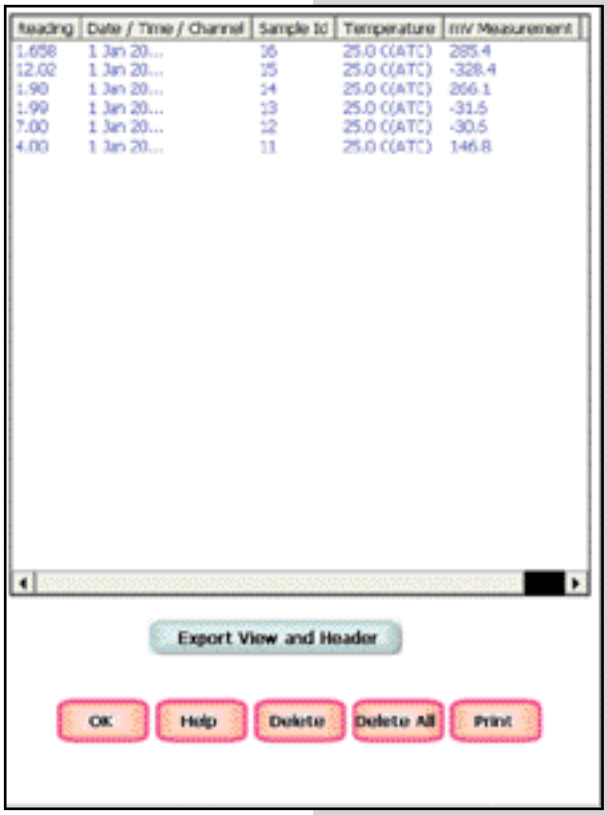
When you touch the **Help** button, information about the current screen appears.
This information includes step-by-step instructions for operating the meter from
the current screen and possible applications information for that screen.

Touch **Delete** to delete a selected data point from the list. To delete a data point, first touch the data point you want to delete then touch the **Delete** button.

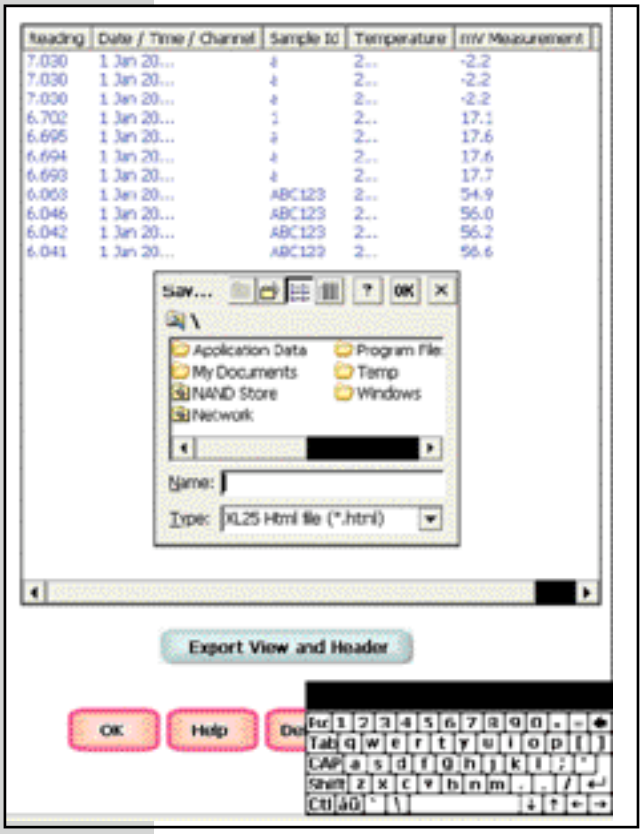
Touch **Delete All** to delete all the data point in the memory.

Touch **Print** to print all the data points in the memory.

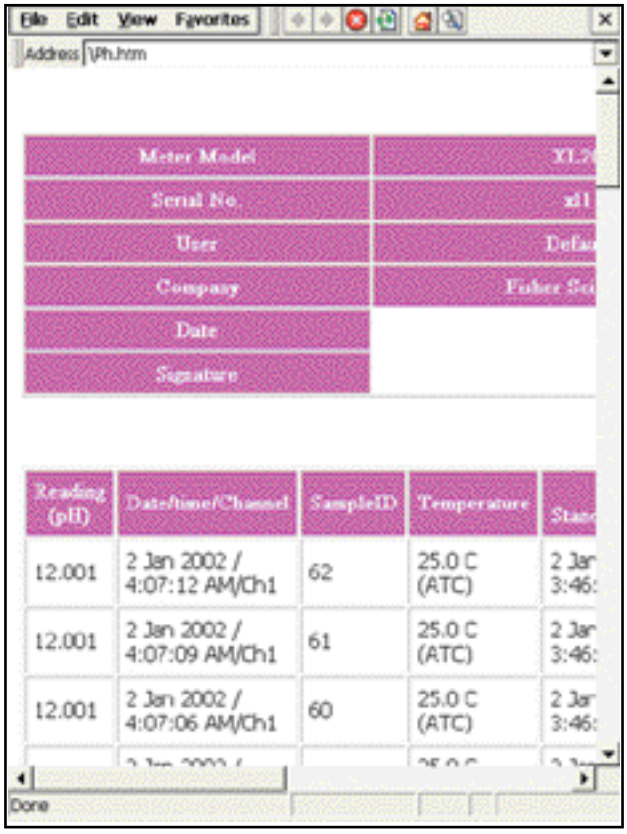
See next page for **Export View and Header** explanation.


Reading
Date / Time / Channel
Sample Id
Temperature
mV Measurement
1.658 1 Jan 20... 16 25.0 C(ATC) 285.4
12.02 1 Jan 20... 15 25.0 C(ATC) -328.4
1.90 1 Jan 20... 14 25.0 C(ATC) 266.1
1.99 1 Jan 20... 13 25.0 C(ATC) -31.6
7.00 1 Jan 20... 12 25.0 C(ATC) -30.5
4.00 1 Jan 20... 11 25.0 C(ATC) 146.8
Export View and Header
OK
Help
Delete
Delete All
Print

Touch **Export View and Header** to save your data in HTML format. The file can be stored in either the Nand flash, SD Card or any of the other available locations as shown in the window. After having selected the path, touch the alphanumeric keypad to name your file.



Touch the alphanumeric keypad to name your file.



Export view in HTML format

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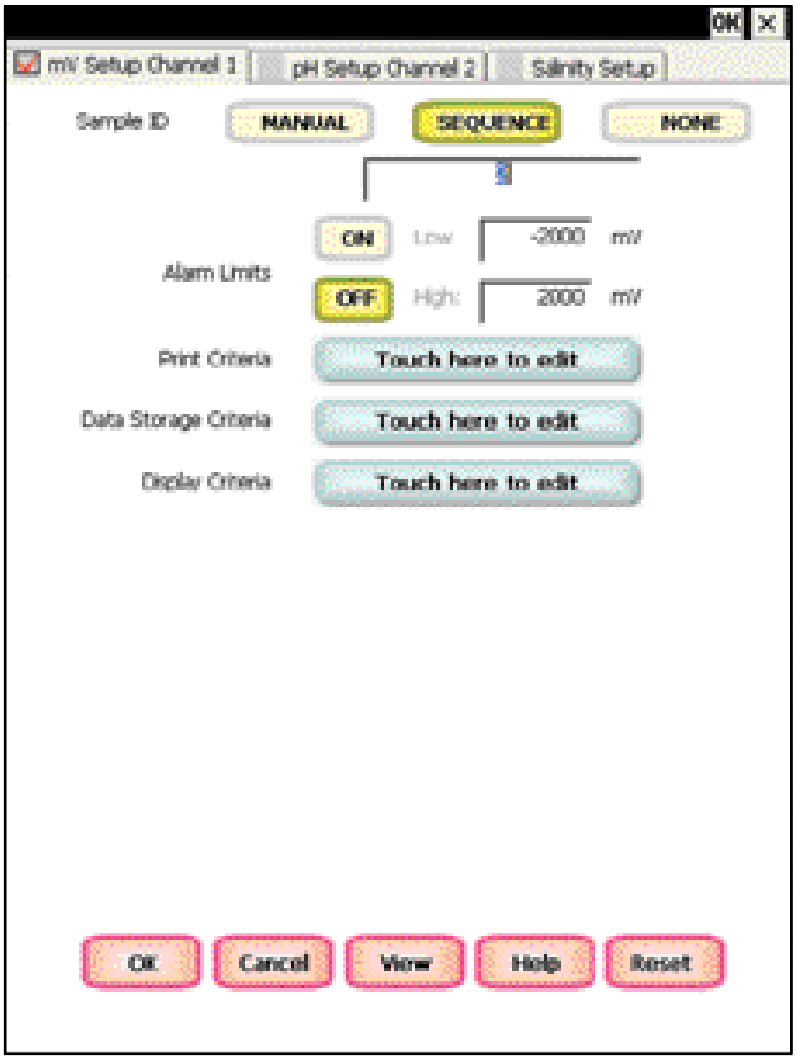
The mV Setup screen presents many options to control the operating parameters of the meter. The meter is factory set with regard to these options, and is ready for use under most circumstances (see appendix page 121 for default settings). The mV Setup section will guide you through the various options available in the mV setup mode.



Function buttons on mV Setup Screen

Touch **OK** to confirm mV Setup and return to the mV Measure screen.

Touch **Cancel** to exit and return to the mV Measure screen without confirming mV Setup.

Touch **View** to view all mV data points stored in memory. See pages 42-43 for details.

When you touch the **Help** button, information about the current screen appears. This information includes step-by-step instructions for operating the meter from the current screen and possible applications information for that screen.

Touch **Reset** to reset all mV Setup Criteria to the factory default.

To access the Setup screen:

1. Make sure you are in the mV Measure screen (either dual display or single display; see page 22).
2. Touch the **Setup** button to access the mV Setup screen.

If you were in triple or dual display mode, you have access to the Setup mode for each channel displayed. Touch the **Setup Channel** buttons at the top of the screen to toggle back and forth between the setup screens for each channel. To change mV parameters, select the mV Setup button.

If you were in single display mode, you will access the Setup mode for the single channel displayed only.

See page 23 for pH setup directions.

See page 35 for mV setup directions.

See page 44 for ion concentration setup directions.

See page 57 for conductivity setup directions.

A sample ID is required if you wish to log data or do a timed printing. Whenever this option is active, each time you touch **Log Data** on the mV Measure screen, the mV value along with date/time/channel and the sample ID will be sent to data storage.

You can manually enter an alphanumeric identification number of 10 characters for any sample or you can have the meter sequentially number your samples beginning at the number of your choice. You can also choose to deactivate the sample ID.

To set sample ID — Manual:

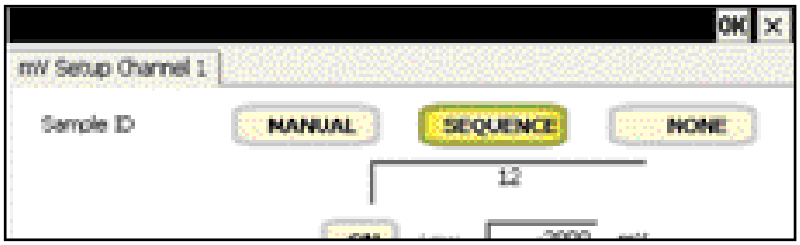
1. Touch **Manual** for manual Sample ID entry.
2. The current ID is displayed on the screen.
3. Use the alphanumeric keypad on the screen to enter the desired Sample ID. The **BS** key will allow you to backspace to remove a character that was incorrectly entered.
4. Touch **Enter** to accept current Sample ID and return to the mV Setup screen.

To set sample ID — Sequential

1. Touch **Sequential** for sequential Sample ID entry
2. The current ID is displayed on the screen
3. Use the numeric keypad on the screen to enter the desired Sample ID number that you would like your sequential Sample ID assignment to begin with. Every time you touch **Print** or **Log Data** on the pH Measure screen, the Sample ID will increase by 1. The **BS** key will allow you to backspace to remove a character that was incorrectly entered.
4. Touch **Enter** to accept the first sequential Sample ID and return to the mV Setup screen.

To deactivate the sample ID assignment — None

1. Touch **None** to deactivate the sample ID assignment



This option allows you to set alarm limits for the mV measuring mode. If the mV value of the measurement is outside of the boundaries set by the minimum and maximum limits, audible and visual warnings will let you know that your sample measurement was outside of the set limits.

The Alarm Limit can be set from -2000.0 mV to 2000.0 mV

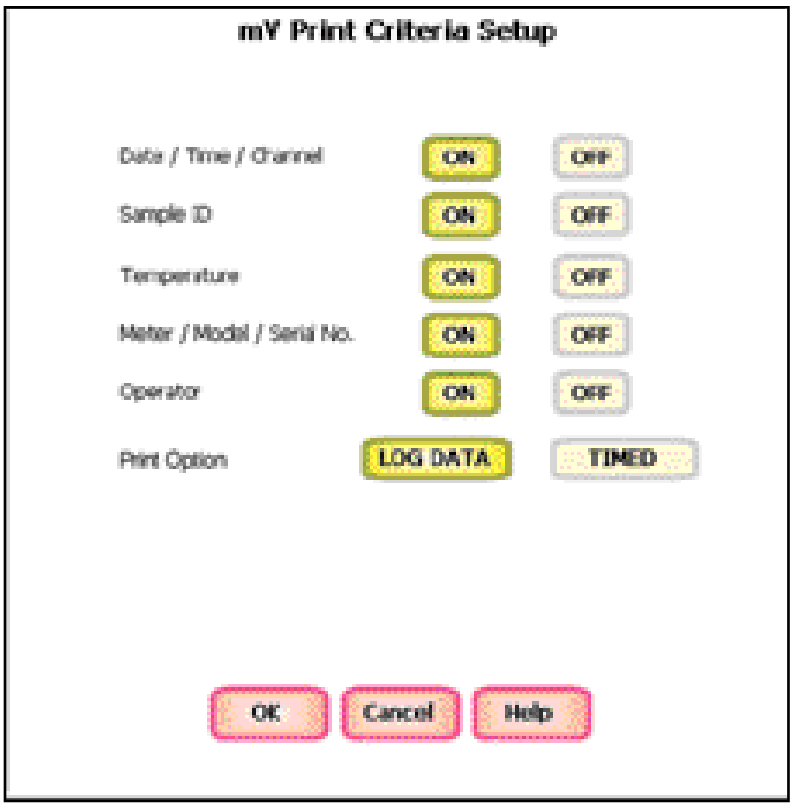
To set Alarm Limits

1. Touch **ON** or **OFF** to set the status of the alarm of mV mode
2. Touch the **Low box** and use keypad to enter the new limit values.
3. Touch **Enter** on the keypad to accept this limit and return to the pH mV Setup screen.
4. Touch the **High box** and use keypad to enter the new limit values.
5. Touch **Enter** on the keypad to accept this limit and return to the mV Setup screen.

This screen allows you to select which criteria are printed with the measurement when you print the data. The status of the current print criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option. Any active criteria will be printed on demand.

To set Print Criteria

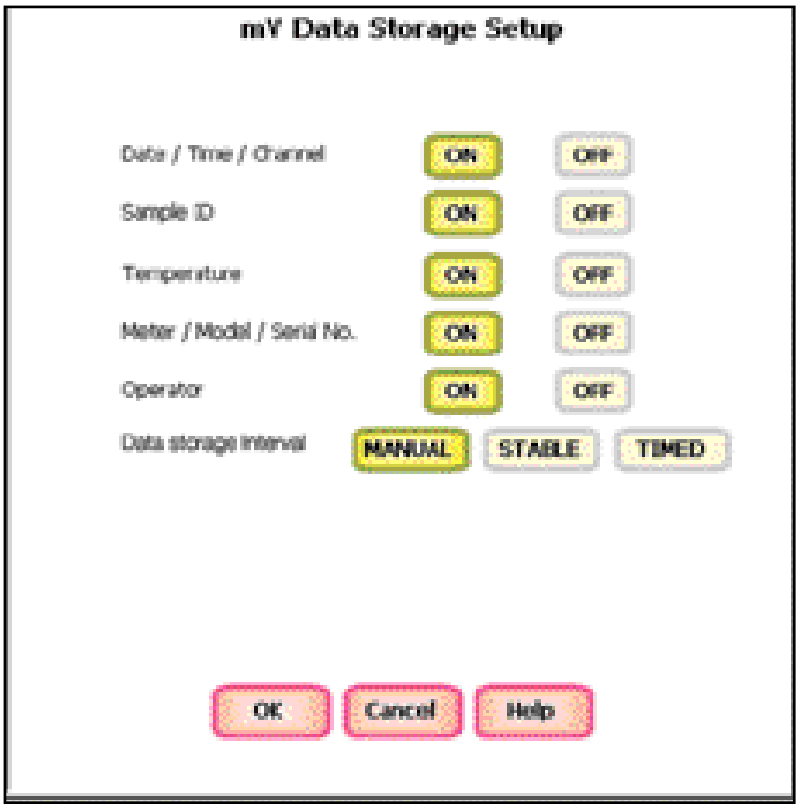
1. Touch the **Touch here to edit** button next to the Print Criteria to access the mV Print Criteria Setup screen.
2. Touch **ON** or **OFF** to change the status of a criteria you want to modify.
3. Repeat step **2** for all the remaining criteria except **Print Option**.
4. For Print Option, select between **Log Data** and **Timed**. If "Log Data" is selected, clicking on the "Print" button from the Measurement screen will send the logged data to the printer. If "Timed" is selected, you can print data at an interval you select. This data is buffered and is sent to the printer when the page is full.
5. Touch **OK** button to accept the changes of the entire group of print criteria and return to the mV Setup screen.



This screen allows you to select which criteria are stored in the data logger with the measurement when you store the data .The status of the current data storage criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option. Any active criteria will be stored on demand.

To set Data Storage Criteria

1. Touch the **Touch here to edit** button next to the Data Storage Criteria to access the mV Data Storage Setup screen.
2. Touch **ON** or **OFF** to change the status of a criteria you want to modify.
2. Touch **ON** or **OFF** to change the status of a criteria you want to modify.
3. Repeat step **2** for all the remaining criteria except **Data storage Interval**.
4. For Data storage Interval, touch **MANUAL** to log mV data only when the **Log Data** button is pushed, touch **STABLE** to automatically log mV data when mV reading is stable, or touch **TIMED** to set a specific timed interval in seconds to log mV data.
5. Touch **OK** button to accept the changes of the entire group of data storage criteria and return to the mV Setup screen.



This screen allows you to choose what information you would like to be displayed on the mV Measure screen, particularly the information contained in the data box at the bottom of the Measurement screen. The status of the current display criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option.

To set Display Criteria

1. Touch the **Touch here to edit** button next to the Display Criteria to access the mV Display Criteria Setup screen.
2. Touch **ON** or **OFF** to change the status of a criteria you want to modify.
3. Repeat step **2** for all the remaining criteria except **Display Resolution**.
4. For Display Resolution, touch **X** to set display with 1 mV resolution or touch **X.X** to set display with 0.1 mV resolution.
3. Touch **OK** button to accept the changes of the entire group of display criteria and return to the mV Setup screen.

The XL50 has a memory capacity to store up to 1000 data points. The View Stored Data screen allows you to look at specific data points stored in the meter based on the meters memory capacity.

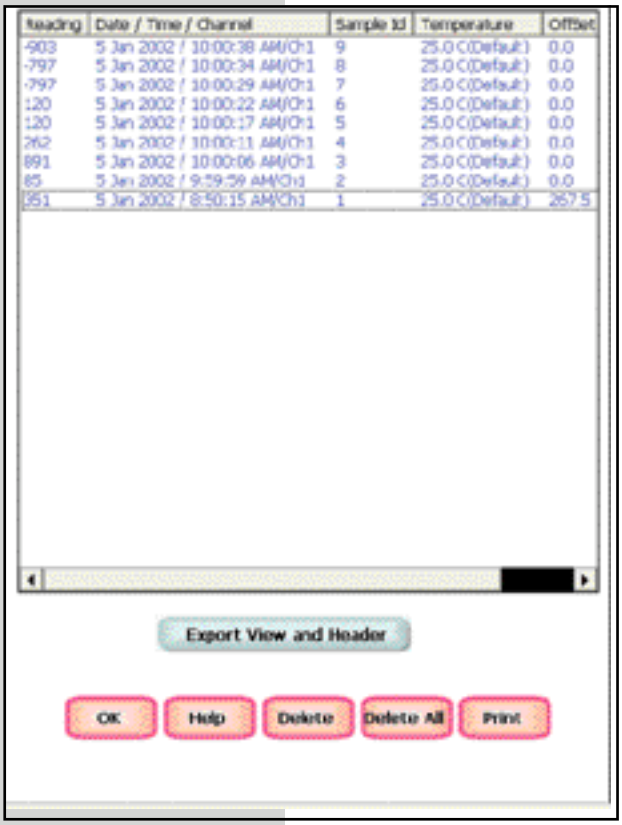
The meter stores mV data under the following parameters:

- Reading
- Operator
- Date / Time / Channel
- Sample Id
- Meter Model Serial No.

To View Stored Data

1. Touch the **View** button in the mV Setup screen

You can only log 1000 data points at a time. To clear space for new data points, you have to delete the same number of old data points as you want to add new data points.



Function buttons on View Stored Data Screen

Touch **OK** to go back to the pH Setup screen from the View Stored Data screen.

When you touch the **Help** button, information about the current screen appears.
This information includes step-by-step instructions for operating the meter from
the current screen and possible applications information for that screen.

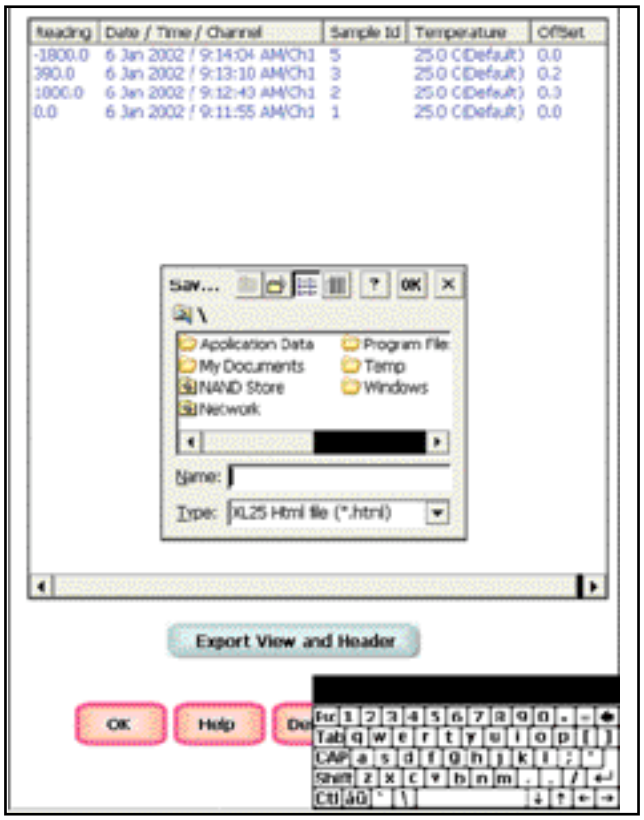
Touch **Delete** to delete a selected data point from the list. To delete a data point, first touch the data point you want to delete then touch the **Delete** button.

Touch **Delete All** to delete all the data point in the memory.

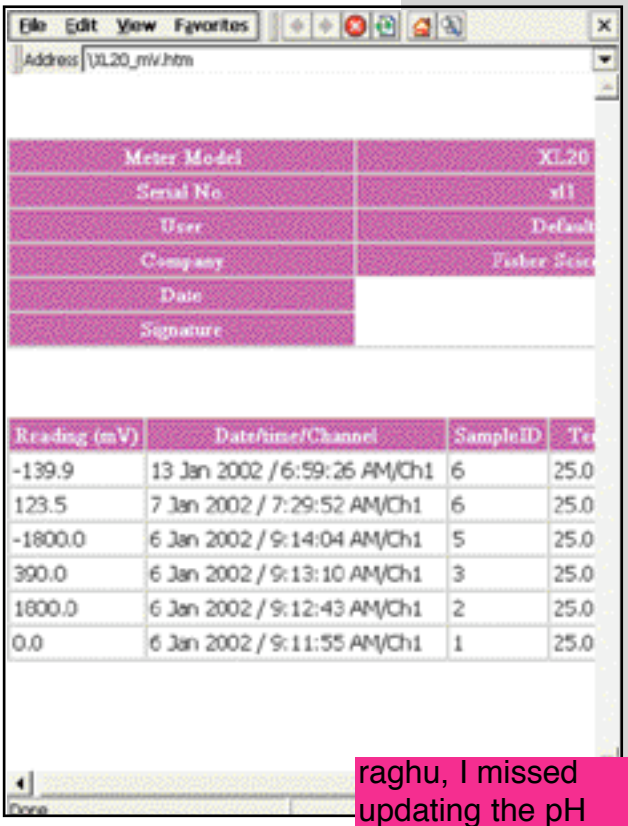
Touch **Print** to print all the data points in the memory.

See next page for **Export View and Header** explanation.

Touch **Export View and Header** to save your data in HTML format. The file can be stored in either the Nand flash, SD Card or any of the other available locations as shown in the window. After having selected the path, touch the alphanumeric keypad to name your file.



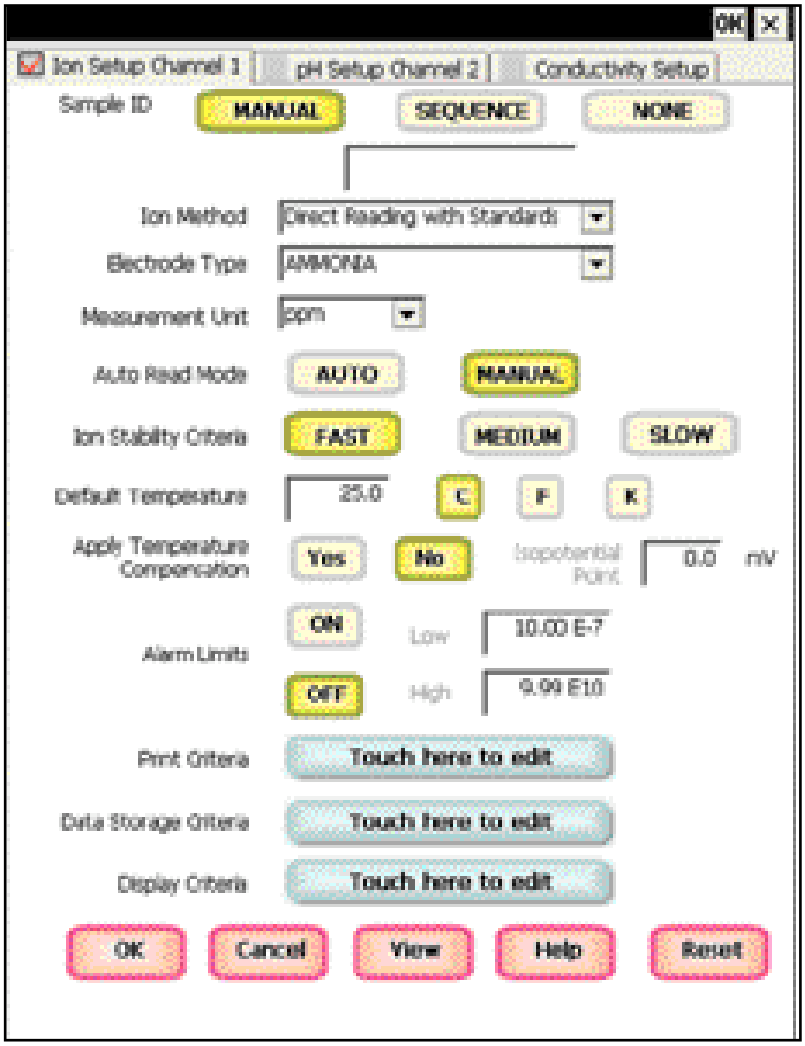
Touch the alphanumeric keypad to name your file.


File Edit View Favorites
Address \XL20_mV.htm
Meter Model
XL20
Serial No
Date
Signature
Reading (mV)
Date/time/Channel
SampleID
-139.9 13 Jan 2002 / 6:59:26 AM/Ch1 6 25.0
123.5 7 Jan 2002 / 7:29:52 AM/Ch1 6 25.0
-1800.0 6 Jan 2002 / 9:14:04 AM/Ch1 5 25.0
390.0 6 Jan 2002 / 9:13:10 AM/Ch1 3 25.0
1800.0 6 Jan 2002 / 9:12:43 AM/Ch1 2 25.0
0.0 6 Jan 2002 / 9:11:55 AM/Ch1 1 25.0

Export view in HTML format

raghu, I missed updating the pH screen, but the mV image above is the newest one I have. Do you have a newer one to send me?

The Ion Setup screen presents many options to control the operating parameters of the meter. The meter is factory set with regard to these options, and is ready for use under most circumstances (see appendix page 121 for default settings). The operating parameters of the Ion mode can be set and controlled from the Ion setup screen. The Ion Setup section will guide you through the various options available in the Ion setup mode.



Function Buttons on Ion Setup Screen

Touch **OK** to confirm Ion Setup and return to the Ion Measure screen.

Touch **Cancel** to exit and return to the Ion Measure screen without confirming Ion Setup.

Touch **View** to view all Ion data points stored in memory. See pages 55-56 for details.

When you touch the **Help** button, information about the current screen appears. This information includes step-by-step instructions for operating the meter from the current screen and possible applications information for that screen.

Touch **Reset** to reset all Ion Setup Criteria to the factory default.

To access the Setup screen:

1. Make sure you are in the Ion Measure screen (either dual display or single display; see page 22).
2. Touch the **Setup** button to access the Ion Setup screen.

If you were in triple or dual display mode, you have access to the Setup mode for each channel displayed. Touch the **Setup Channel** buttons at the top of the screen to toggle back and forth between the setup screens for each channel. To change ion parameters, select the ion Setup button.

If you were in single display mode, you will access the Setup mode for the single channel displayed only.

See page 23 for pH setup directions.

See page 35 for mV setup directions.

See page 44 for ion concentration setup directions.

See page 57 for conductivity setup directions.

A sample ID is required if you wish to log data or do a timed printing. Whenever this option is active, each time you touch **Log Data** on the Ion Measure screen, the Ion value along with date/time/channel and the sample ID will be sent to data storage.

You can manually enter an alphanumeric identification number of 10 characters for any sample or you can have the meter sequentially number your samples beginning at the number of your choice. You can also choose to deactivate the sample ID.

To set sample ID — Manual:

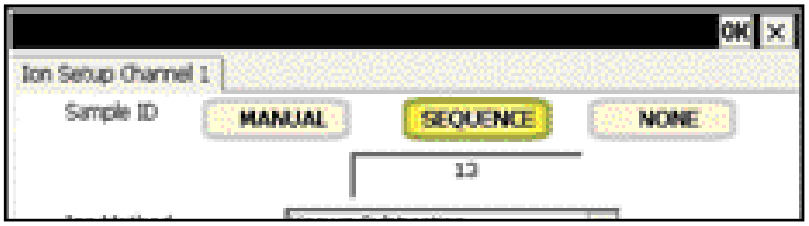
1. Touch **Manual** for manual Sample ID entry
2. The current ID is displayed on the screen
3. Use the alphanumeric keypad on the screen to enter the desired Sample ID. The **BS** key will allow you to backspace to remove a character that was incorrectly entered.
4. Touch **Enter** to accept current Sample ID and return to the Ion Setup screen.

To set sample ID — Sequential

1. Touch **Sequence** for sequential Sample ID entry
2. The current ID is displayed on the screen
3. Use the numeric keypad on the screen to enter the desired Sample ID number that you would like your sequential Sample ID assignment to begin with. Every time you touch **Print** or **Log Data** on the Ion Measure screen, the Sample ID will increase by 1. The **BS** key will allow you to backspace to remove a character that was incorrectly entered.
4. Touch **Enter** to accept the first sequential Sample ID and return to the Ion Setup screen.

To deactivate the sample ID assignment — None

1. Touch **None** to deactivate the sample ID assignment



The Ion Method window lets you select from a variety of ion measurement methods.

Direct Reading with Standards: The most common method of ion measurement. When using this method, you will use standards of known values to standardize the meter with ion standards. An ionic strength adjuster (ISA) is added to both the standards and the sample. Two to five standards are used. The standards should bracket the expected value of the sample. The ion specific electrode is immersed in a stirring sample and the ion concentration is read directly from the meter.

Direct Reading with Blank Offset: Commonly used for determining ion concentration in a sample with a very low level of ions. Due to background interference at low concentration levels, a blank is used and the value of the ion concentration in the blank is subtracted from the value of the measured sample.

Known Addition Method: An incremental method used for samples with a complex matrix. A standard with a known concentration of the ion species of interest is added to the sample. The difference in mV potential is then used to calculate ion concentration.

Known Subtraction Method: An incremental method where the ion of interest in the sample is not identical to the ion in the standard solution. The standard of known ion concentration that is added to the sample quantitatively reacts in the sample with the ion of interest. This reaction removes a fixed amount of the ion of interest from the sample solutions. The ion concentration is then calculated based upon the difference in the mV potential.

Analate Addition: A modification of the known addition method. The initial mV measurement is recorded in a standard solution. The ion in the standard solution is the ion of interest and is detected by the ion selective electrode in use. A sample containing the ion of interest is then added to the standard solution. The difference in the mV potential is then used in the calculation of the concentration of the ion of interest. This method is useful if the sample temperature is significantly different than that of the standard. When the small volume of hot sample is added to the larger volume, the temperature impact becomes negligible.

Analate Subtraction: Useful when there is no ion specific electrode available to directly measure the concentration of the ion of interest. This method employs the addition of a sample of the ion of interest to a standard containing a different ion of known concentration. The ion of interest will quantitatively react with the ion in the standard, creating a complex and removing the ion from the standard solution. The ion specific electrode is specific for the ion in the standard solution and not for the ion of interest. The difference in mV potential is used to calculate the concentration of the ion of interest based upon this quantitative reaction.

To select Ion Method:

1. Touch the Arrow key to the right of Ion Method
2. Touch the desired method.

Select Electrode Type

This screen lets you select the type of electrode that is specific for your ion of interest. Your choice of electrode informs the meter which default slope to use in the calculations made for electrode efficiency and sample concentration. Once you have selected an electrode, you will not be required to enter the default slope numerically.

Note: the default slope value specific for the electrode that you choose is a theoretical slope value that is used in the calucaltions to determine the efficiency of your electrode. This slope value is not the slope value that is displayed in the data box of the measurement screen. You will still need to standardize the meter using ion standards to determine the actual efficiency of your electrode.

Changing electrode type will erase the previous standardization.

To select electrode type:

1. Touch the Electrode Type box to view the list of electrodes.
2. Use the scroll bar to select the desired electrode type.

If you are using several different electrodes, you can create a different User Profile for each electrode to save individual parameters and calibration information (i.e. “Ammonia Samples” or “Sodium Batch Testing”. See pages 95-97 for directions on how to set up a user profile.

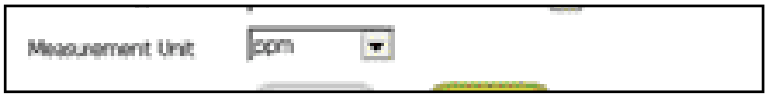
Select Measurement Units

This screen lets you select the units in which the meter will report the concentration of the ion of interest. The current units are displayed on the screen.

To select measurement units:

1. Touch the Measurement Unit box to view the list of measurement units.
2. Use the scroll bar to select the desired units.

Once the unit has been calibrated with a particular unit of measurement, if an attempt is made to change the units, the unit comes out with a warning message: “Changing the measurement unit will erase previous standardization. Do you wish to continue?”



Fisher Scientific

Select Auto Read Mode

You can use this meter when the Auto Read function is active or when it is inactive. When the Auto Read function is active, the meter will lock onto a reading when the meter recognizes it as stable. The meter will not deviate from this reading until Measure is touched. If the Auto Read function is inactive, then the meter will continuously monitor the concentration of the ion of interest. The Measure screen display will indicate any fluctuation in the ion concentration.

To select Auto Read Mode

1. Touch **MANUAL** or **AUTO** to choose the desired read mode.

Regardless of the status of the Auto Read Mode, STABLE will be displayed as the meter recognizes the measurement as stable.

Set Ion Stability Criteria

This setup screen allows you to determine how quickly the meter will respond to electrode drift. There are three speed settings: fast, medium and slow

To set Ion Stability Criteria

1. Touch **FAST**, **MEDIUM**, **SLOW** to choose the desired stability criteria.

Stability criteria are more stringent at the slower setting. Therefore, if the highest precision is required, then a slow setting would be desired. The default setting is the **FAST** and this should be adequate for the majority of applications. without making any changes.

Set Default Temperature

It is a well known fact that ion concentration is a temperature dependent measurement. The factory default setting is 25°C. If you are measuring a solution that is not 25°C and if you are not using a temperature probe, then you should enter the temperature value of that solution in order to get the correct concentration value. The current default temperature setting will be displayed on the screen.

The default temperature can be set from -5°C to 105°C.

To set Default Temperature

1. Select temperature units by touching the appropriate unit button: **C** (Celsius), **F** (Fahrenheit) or **K** (Kelvin).
2. Touch the **Default Temperature box** and use the numeric keypad to enter the desired default temperature (-5°C to 105°C).
3. Press **Enter** in the keypad to return to Ion Setup screen.

Best results are obtained when the standards and the samples are at the same temperature.

Set Apply Temperature Compensation

Ion concentration is a temperature dependent measurement. Best results are obtained when the standards and the samples are standardized and calibrated at the same temperature. However, if you have experimentally determined the isopotential point of your electrode then you can choose to set ATC to YES and enter the isopotential value. This option is set to NO by default.

To set Apply Temperature Compensation

1. Touch **YES** to choose Apply Temperature Compensation.

Set Isopotential Point

The isopotential point is the millivolt reading for an electrode at which temperature has no effect on the measurement. Ion Selective Electrodes, unlike pH electrodes, are not designed to achieve any particular isopotential point. If samples and standards are at different temperatures when performing ISE experiments, it will be necessary to e xperimentally determine the isopotential point of your own Ion Specific Electrode.

To set Isopotential Point

1. Touch the **Isopotential Point box** and use the numeric keypad to enter the desired mV setting for the new isopotential point.
2. Touch **Enter** to accept this value and return to Ion Setup screen.

Set Alarm Limits

This option allows you to set alarm limits for the ion measuring mode. If the ion concentration value of the measurement is outside of the boundaries set by the minimum and maximum limits, a visual warning will appear to let you know that your sample measurement was outside of the set limits.

The validity range of alarm limits is 0.000001 to 99,900,000,000.

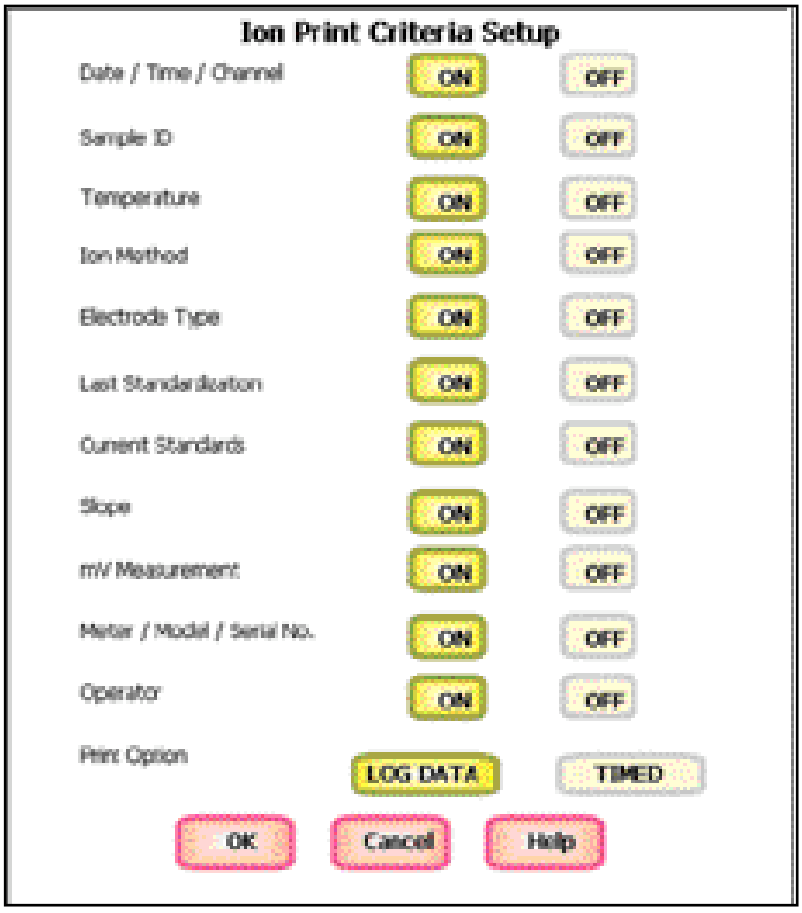
To set Alarm Limits

1. Touch **ON** or **OFF** to set the status of the alarm.
2. Touch the **Low box** and use keypad to enter the new limit values.
3. Touch **Enter** on the keypad to accept this limit and return to the Ion Setup screen.
4. Touch the **High box** and use keypad to enter the new limit values.
5. Touch **Enter** on the keypad to accept this limit and return to the Ion Setup screen.

This screen allows you to select which criteria are printed with the measurement when you print the data. The status of the current print criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option. Any active criteria will be printed on demand.

To set Print Criteria

1. Touch the **Touch here to edit** button next to the Print Criteria to access the Ion Print Criteria Setup screen.
2. Touch **ON** or **OFF** to change the status of a criteria you want to modify.
3. Repeat step **2** for all the remaining criteria except **Print Option**.
4. For Print Option, select between **Log Data** and **Timed**. If "Log Data" is selected, clicking on the "Print" button from the Measurement screen will send the logged data to the printer. If "Timed" is selected, you can print data at an interval you select. This data is buffered and is sent to the printer when the page is full.
5. Touch **OK** button to accept the changes of the entire group of print criteria and return to the Ion Setup screen.

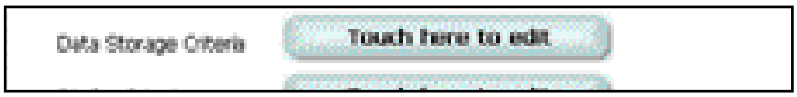


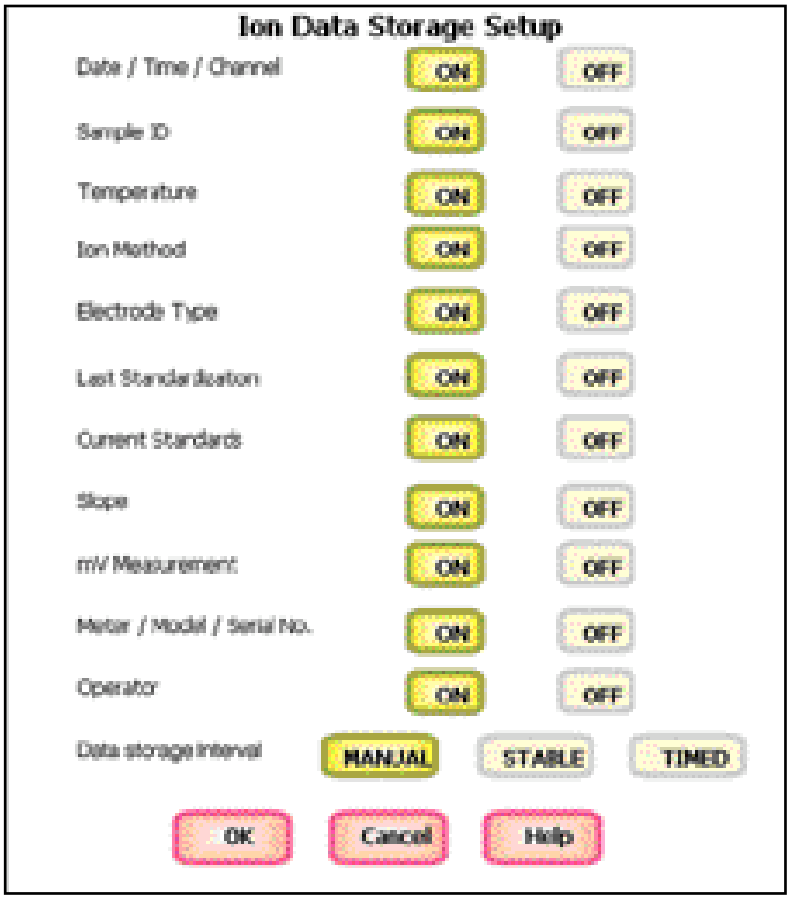
Fisher Scientific

This screen allows you to select which criteria are stored in the data logger with the measurement when you store the data .The status of the current data storage criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option. Any active criteria will be stored on demand.

To set Data Storage Criteria

1. Touch the **Touch here to edit** button next to the Data Storage Criteria to access the pH Data Storage Setup screen.
2. Touch **ON** or **OFF** to change the status of a criteria you want to modify.
3. Repeat step **2** for all the remaining criteria except **Data storage Interval**.
4. For Data storage Interval, touch **MANUAL** to store Ion data only when the **Log Data** button is pushed, touch **STABLE** to automatically store Ion data when Ion reading is stable, or touch **TIMED** to set a specific timed interval in seconds to store Ion data.
5. Touch **OK** button to accept the changes of the entire group of data storage criteria and return to the Ion Setup screen.

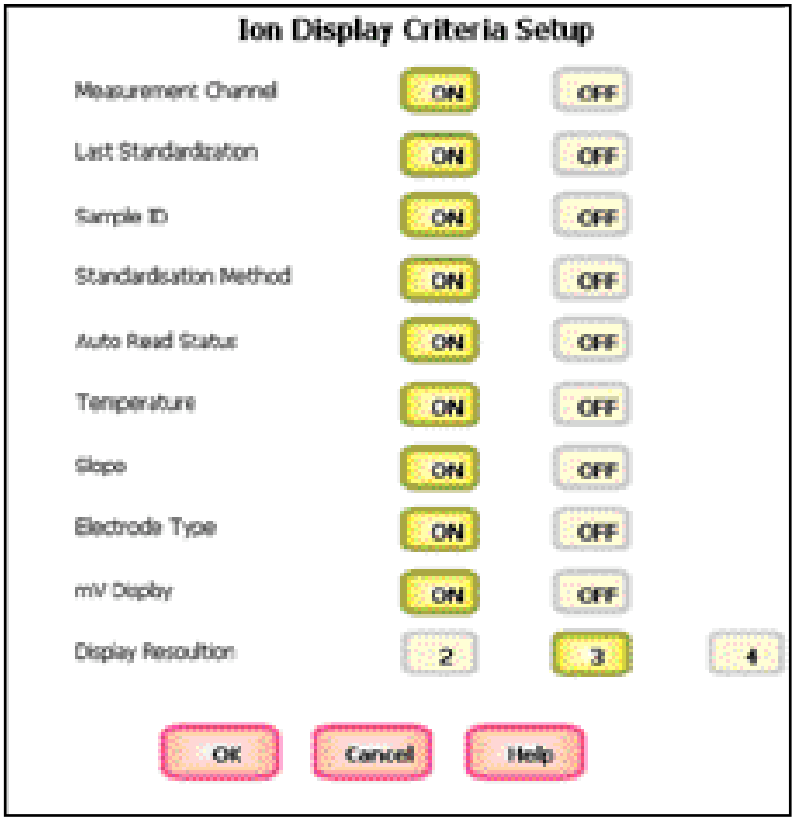




This screen allows you to choose what information you would like to be displayed on the Ion Measure screen, particularly the information contained in the data box at the bottom of the Measurement screen. The status of the current display criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option.

To set Display Criteria

1. Touch the **Touch here to edit** button next to the Display Criteria to access the pH Display Criteria Setup screen.
2. Touch **ON** or **OFF** to change the status of a criteria you want to modify.
3. Repeat step **2** for all the remaining criteria except **Display Resolution**.
4. **Display Resolution** lets you select the number of significant figures that will be used when reporting your ion measurement. Touch 2, 3, or 4 to select the desired significant digits.
5. Touch **OK** button to accept the changes of the entire group of display criteria and return to the Ion Setup screen.



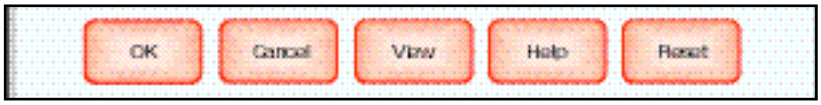
The XL50 has a memory capacity to store up to 1000 data points. The View Stored Data screen allows you to sort and look at specific data points stored in the meter based on the meters memory capacity. The stored data can be sorted by any of the parameters available in the screen header.

The meter stores Ion data under the following parameters:

- Reading
- Date / Time / Channel
- Sample Id
- Temperature
- mV measurement

To View Stored Data

1. Touch the **View** button in the mV Setup screen



You can only log 1000 data points at a time. To clear space for new data points, you have to delete the same number of old data points as you want to add new data points.

Function buttons on View Stored Data Screen

Touch **OK** to go back to the Ion Setup screen from the View Stored Data screen.

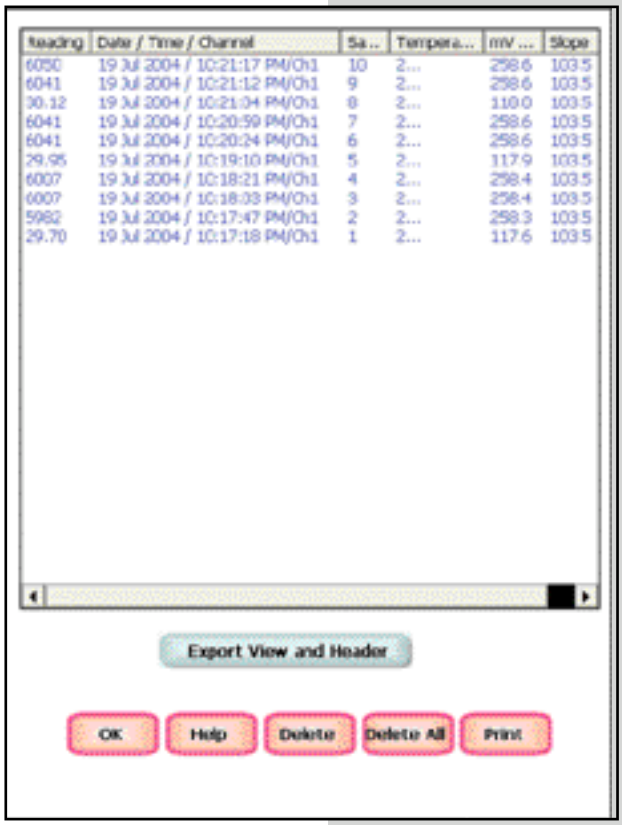
When you touch the **Help** button, information about the current screen appears. This information includes step-by-step instructions for operating the meter from the current screen and possible applications information for that screen.

Touch **Delete** to delete a selected data point from the list. To delete a data point, first touch the data point you want to delete then touch the **Delete** button.

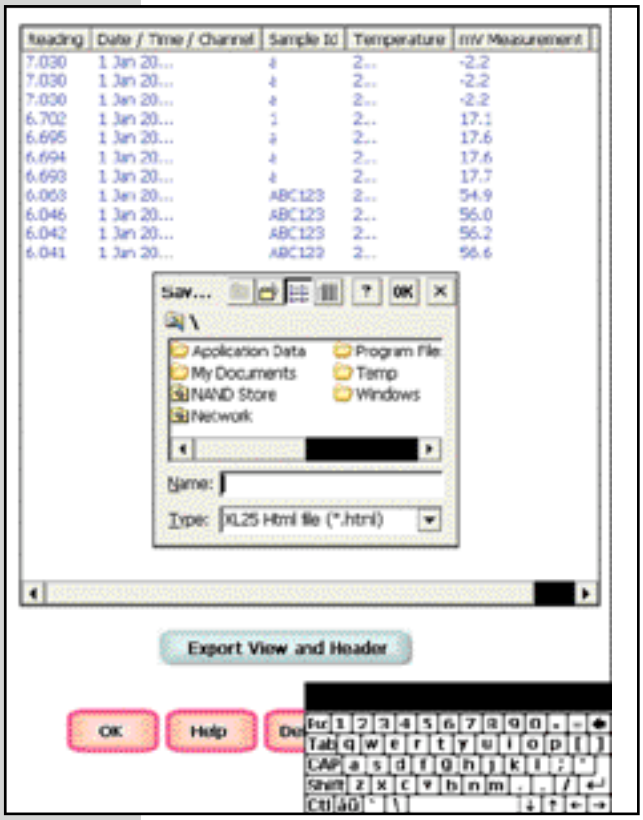
Touch **Delete All** to delete all the data point in the memory.

Touch **Print** to print all the data points in the memory.

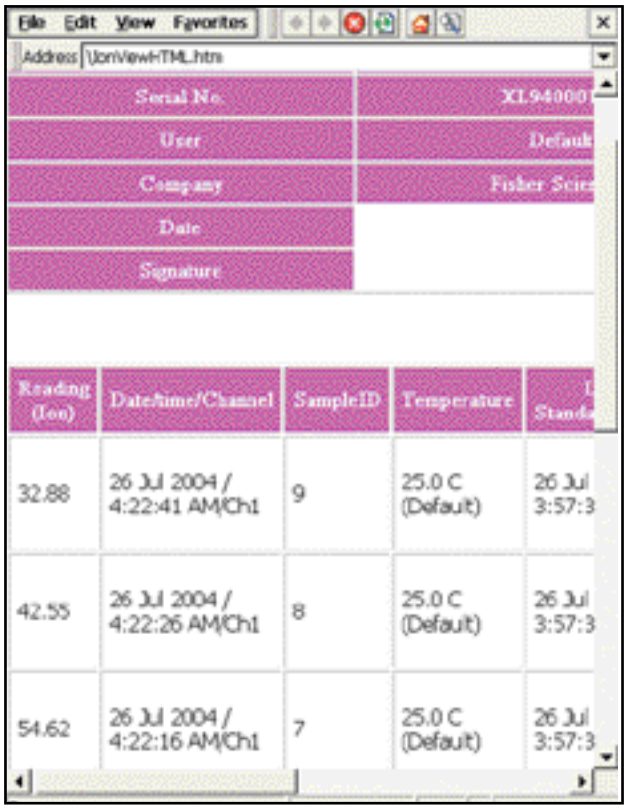
See next page for **Export View and Header** explanation.



Touch **Export View and Header** to save your data in HTML format. The file can be stored in either the Nand flash, SD Card or any of the other available locations as shown in the window. After having selected the path, touch the alphanumeric keypad to name your file.



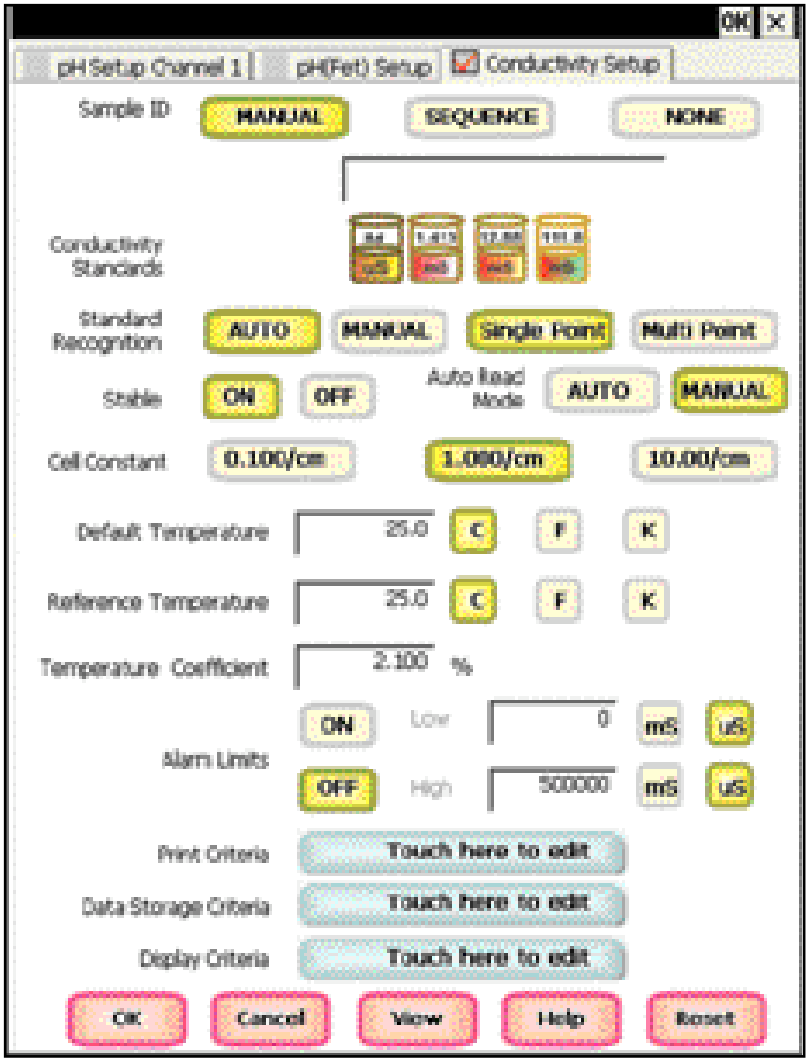
Touch the alphanumeric keypad to name your file.



Export view in HTML format

Fisher Scientific

The conductivity Setup screen present many options to control the operating parameters of the meter. The meter is factory set with regard to these options, and is ready for use under most circumstances (see appendix page 122 for default settings). The operating parameters of the conductivity mode can be set and controlled from the conductivity setup screen. The conductivity Setup section will guide you through the various options available in the conductivity setup mode.



Function Buttons on Conductivity Setup Screen

Touch **OK** to confirm conductivity Setup and return to the conductivity Measure screen.

Touch **Cancel** to exit and return to the conductivity Measure screen without confirming conductivity Setup.

Touch **View** to view all conductivity data points stored in memory. See pages 67-68 for details.

When you touch the **Help** button, information about the current screen appears. This information includes step-by-step instructions for operating the meter from the current screen and possible applications information for that screen.

Touch **Reset** to reset all conductivity Setup Criteria to the factory default.

To access the Setup screen:

1. Make sure you are in the conductivity Measure screen (either dual display or single display; see page 22).
2. Touch the **Setup** button to access the conductivity Setup screen.

If you were in triple or dual display mode, you have access to the Setup mode for each channel displayed. Touch the **Setup Channel** buttons at the top of the screen to toggle back and forth between the setup screens for each channel. To change Conductivity parameters, select the Conductivity Setup button.

If you were in single display mode, you will access the Setup mode for the single channel displayed only.

See page 23 for pH setup directions.

See page 34 for mV setup directions.

See page 44 for ion concentration setup directions.

See page 57 for conductivity setup directions.

A sample ID is required if you wish to log data or activate a timed printing. Whenever this option is active, each time you touch **Log Data** on the conductivity Measure screen, the conductivity value along with date/time/channel and the sample ID will be sent to data storage.

You can manually enter an alphanumeric identification number of 10 characters for any sample or you can have the meter sequentially number your samples beginning at the number of your choice. You can also choose to deactivate the sample ID.

To set sample ID — Manual:

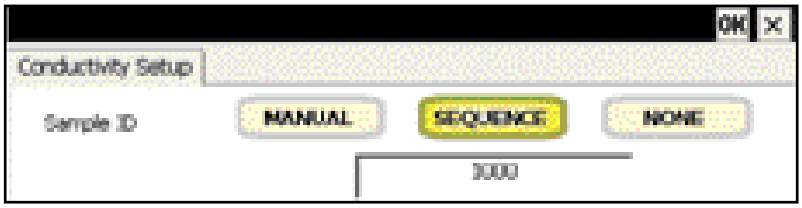
1. Touch **Manual** for manual Sample ID entry.
2. The current ID is displayed on the screen.
3. Use the alphanumeric keypad on the screen to enter the desired Sample ID. The **BS** key will allow you to backspace to remove a character that was incorrectly entered.
4. Touch **Enter** to accept current Sample ID and return to the mV Setup screen.

To set sample ID — Sequential

1. Touch **Sequence** for sequential Sample ID entry
2. The current ID is displayed on the screen
3. Use the numeric keypad on the screen to enter the desired Sample ID number that you would like your sequential Sample ID assignment to begin with. Every time you touch **Print** or **Log Data** on the pH Measure screen, the Sample ID will increase by 1. The **BS** key will allow you to backspace to remove a character that was incorrectly entered.
4. Touch **Enter** to accept the first sequential Sample ID and return to the mV Setup screen.

To deactivate the sample ID assignment — None

1. Touch **None** to deactivate the sample ID assignment



Conductivity Standards

This setup option shows the set conductivity standards available for auto standard recognition. If Manual standard recognition is selected, the Conductivity Standards section will be blank.

Conductivity Standards available with Auto Standard Recognition

Setup Screen with Manual Standard Recognition

Select Standard Recognition

This option allows you to select Automatic standard recognition or manual standard recognition when standardizing. With the automatic standard recognition activated, the meter will automatically recognize the buffers from the preset group (84 uS, 1.413 mS, 12.88 mS and 111.8 mS) and accept them when the meter recognizes the reading as stable.

When in the Manual standard recognition mode, you must enter the buffer value during the standardization procedure. The meter will accept the manually entered buffer once the measurement is stable.

This option also allows you to choose single-point or multi-point standardardization. Use the single-point standardization option if you are measuring samples that close in value. Use the multi-point standardization option if you are measuring a wide range of samples. If a single point calibration is selected, there will be only one calibration factor for the entire range of operation. In the multi point mode, there will be one for each of the 4 ranges.

To select Standard Recognition

1. Touch **Auto** or **Manual** to choose the method of standard recognition.

To select Standardization Points

1. Touch **Single Point** or **Multi Point** to choose the method of standardization.

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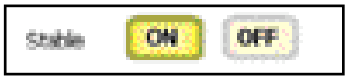
Select Stable Indicator

This setup option lets you turn **ON** or **OFF** the stability indicator. When this function is turned on, the **STABLE** appears when the conductivity reading is stable.

To select Stable indicator

1. Touch **ON** or **OFF** to turn stable indicator on or off.



Select Auto Read Mode

You can use this meter when the Auto Read function is active or when it is inactive. When the Auto Read function is active, the meter will lock onto a reading when the meter recognizes it as stable. The meter will not deviate from this reading until Measure is touched. If the Auto Read function is inactive, then the meter will continuously monitor any resistivity fluctuations.

To select Auto Read Mode

1. Touch **MANUAL** or **AUTO** to choose the desired read mode.

Regardless of the status of the Auto Read Mode, STABLE will be displayed as the meter recognizes the measurement as stable.

Select Cell Constant

This setup option allows you to select the appropriate cell constant of the conductivity cell that you are using. There are three cell constants to choose from. Each is used for a different range of conductivity. The following indicates the optimal conductivity range for the accumet conductivity cells.

	Optimal Conductivity Range	
Cell Constant	**2-cell**	**4-cell**
0.1	0.5 to 200 µS/cm	Not Available
1.0	0.01 to 2 mS/cm	0.01 to 20 mS/cm
10.0	1 to 200 mS/cm	1 to 200 mS/cm

Check the part number on your accumet® conductivity cell and compare to chart on the previous page to determine the cell constant of your conductivity cell.

To select Cell Constant

1. Touch **0.100/cm**, **1.000/cm**, or **10.00/cm** to choose the correct cell constant.

When you change cell constants your calibration factor will automatically reset to default values. It is recommended that you standardize your meter to establish a new calibration factor.

accumet® conductivity cells for the XL50 have a built-in Temperature sensor.

Set Default Temperature

Conductivity is a temperature dependent measurement. This option allows you to select a default temperature that the meter will use along with the temperature coefficient to calculate a temperature corrected conductivity measurement.

If an ATC probe is used any value entered as a default temperature will be overridden in favor of the actual measured temperature of the solution provided to the meter by the ATC probe.

The default temperature can be set from -10°C to 110°C.

To set Default Temperature

1. Select temperature units by touching the appropriate unit button: **C** (Celsius), **F** (Fahrenheit) or **K** (Kelvin).
2. Touch the **Default Temperature box** and use the numeric keypad to enter the desired default temperature (-10°C to 110°C).
3. Press **Enter** in the keypad to return to conductivity Setup screen.

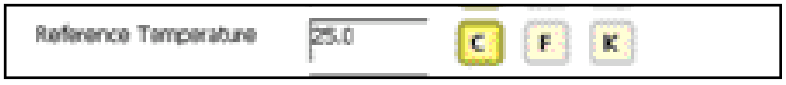
Set Reference Temperature

This setup option allows you to select the reference temperature to be used in the determination of the conductivity of your sample. The reference temperature is the temperature to which the conductivity readings would be normalized.

The reference temperature can be set from 15°C to 30°C.

To set Reference Temperature

1. Select temperature units by touching the appropriate unit button: **C** (Celsius), **F** (Fahrenheit) or **K** (Kelvin).
2. Touch the **Reference Temperature box** and use the numeric keypad to enter the desired default temperature (15°C to 30°C).
3. Press **Enter** in the keypad to return to conductivity Setup screen.



Note: The units of all temperature parameters must match. The meter will automatically modify the temperature units of Default Temperature and Reference Temperature to match the **last** choice made on any of these parameters.

Set Temperature Coefficient

The temperature coefficient is a value that reflects the degree to which the sample's conductivity is effected by temperature changes. The meter will use the set temperature coefficient along with the measured temperature provided by the ATC probe to calculate what the conductivity would be at the selected reference temperature. If no ATC probe is being used, the meter will use the set default temperature in the calculation.

The temperature coefficient can be set from 0 to 10.000%.

To set Temperature Coefficient

1. Touch the **Temperature Coefficient box** and use the numeric keypad to enter the desired default temperature (0 to 10.000).
3. Press **Enter** in the keypad to return to conductivity Setup screen.

NOTE: The meter and probe with ATC will measure temperature even if the temperature coefficient is set to 0.0%, however a temperature correction will not be applied to the measurement.

Set Alarm Limits

This option allows you to set alarm limits for the conductivity measuring mode. If the conductivity value of the measurement is outside of the boundaries set by the minimum and maximum limits, audible and visual warnings will let you know that your sample measurement was outside of the set limits.

The Alarm Limit can be set from 0.0 uS to 500000.00 uS.

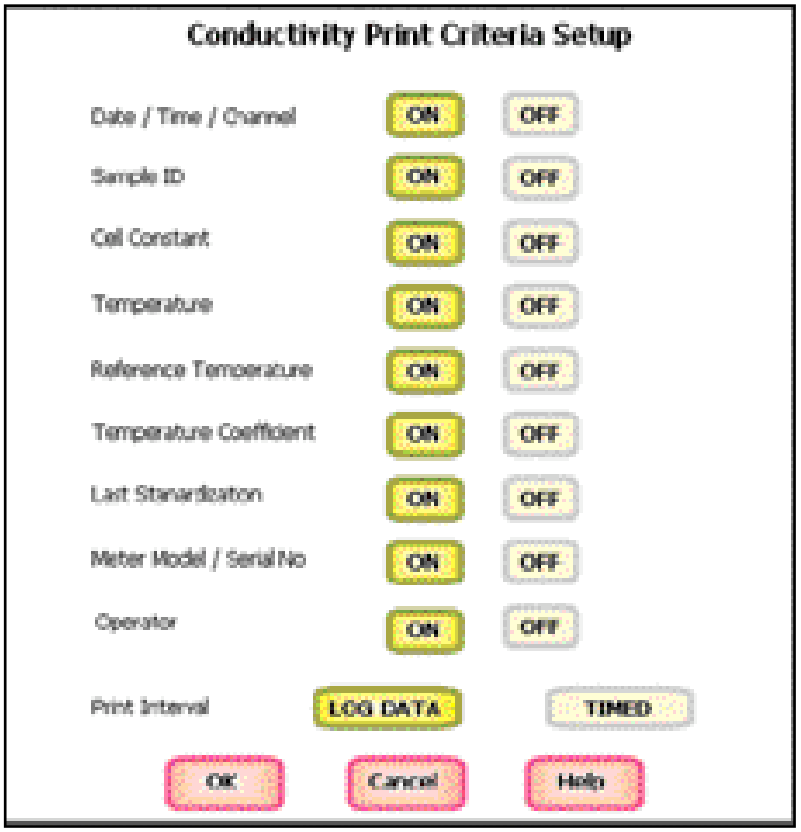
To set Alarm Limits

1. Touch **ON** or **OFF** to set the status of the alarm of conductivity mode
2. Touch the **Low box** and use numeric keypad to enter the new limit values.
3. Touch **Enter** on the keypad to accept this limit and return to the conductivity Setup screen.
4. Touch **uS** or **mS** to select conductivity units of low alarm value.
5. Touch the **High box** and use numeric keypad to enter the new limit values.
6. Touch **Enter** on the keypad to accept this limit and return to the conductivity Setup screen.
7. Touch **uS** or **mS** to select conductivity units of high alarm value.

This screen allows you to select which criteria are printed with the measurement when you print the data. The status of the current print criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option. Any active criteria will be printed on demand.

To set Print Criteria

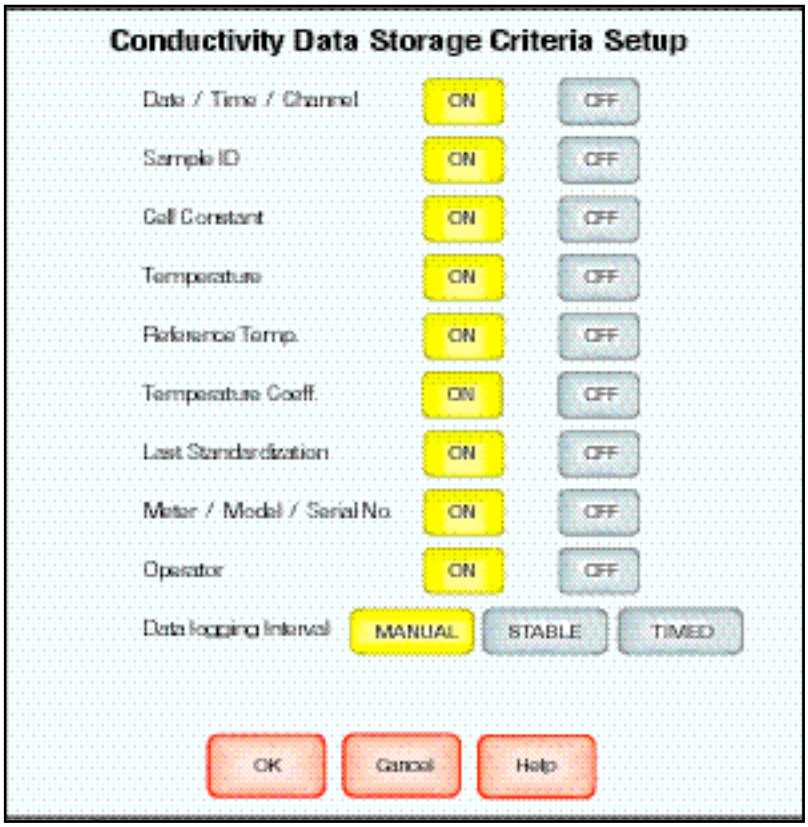
1. Touch the **Touch here to edit** button next to the Print Criteria to access the Conductivity Print Criteria Setup screen.
2. Touch **ON** or **OFF** to change the status of a criteria you want to modify.
3. Repeat step **2** for all the remaining criteria except **Print Interval**.
4. For Print Option, select between **Log Data** and **Timed**. If "Log Data" is selected, clicking on the "Print" button from the Measurement screen will send the logged data to the printer. If "Timed" is selected, you can print data at an interval you select. This data is buffered and is sent to the printer when the page is full.
5. Touch **OK** button to accept the changes of the entire group of print criteria and return to the conductivity Setup screen.



This screen allows you to select which criteria are stored in the data logger with the measurement when you store the data .The status of the current data storage criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option. Any active criteria will be stored on demand.

To set Data Storage Criteria

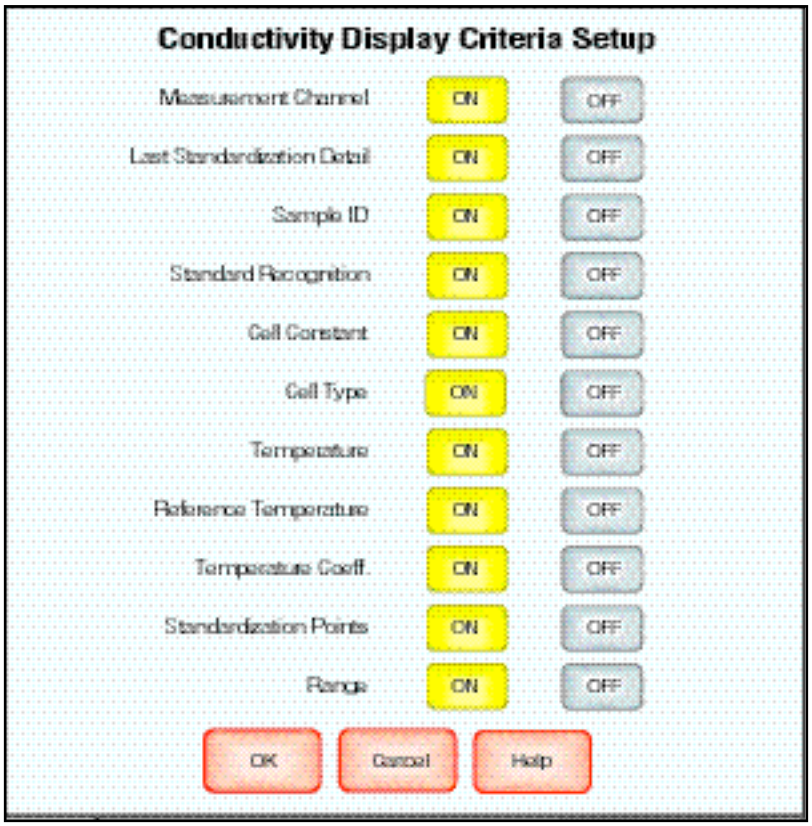
1. Touch the **Touch here to edit** button next to the Data Storage Criteria to access the Conductivity Data Storage Criteria Setup screen.
2. Touch **ON** or **OFF** to change the status of a criteria you want to modify.
3. Repeat step **2** for all the remaining criteria except **Data logging Interval**.
4. For Data logging Interval, touch **MANUAL** to log conductivity data only when the **Log Data** button is pushed, touch **STABLE** to automatically log conductivity data when conductivity reading is stable, or touch **TIMED** to set a specific timed interval in seconds to log conductivity data.
5. Touch **OK** button to accept the changes of the entire group of data storage criteria and return to the conductivity Setup screen.



This screen allows you to choose what information you would like to be displayed on the conductivity Measure screen, particularly the information contained in the data box at the bottom of the Measurement screen. The status of the current display criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option.

To set Display Criteria

1. Touch the **Touch here to edit** button next to the Display Criteria to access the Conductivity Display Criteria Setup screen.
2. Touch **ON** or **OFF** to change the status of a criteria you want to modify.
3. Repeat step **2** for all the remaining criteria.
4. Touch **OK** button to accept the changes of the entire group of display criteria and return to the conductivity Setup screen.



The XL50 has a memory capacity to store up to 1000 data points. The View Stored Data screen allows you to sort and look at specific data points stored in the meter based on the meters memory capacity. The stored data can be sorted by any of the parameters available in the screen header.

The meter stores conductivity data under the following parameters:

- Reading
- Operator
- Date / Time / Channel
- Sample Id
- Temperature
- Last Standardizations
- Meter Model Serial No.

To View Stored Data

1. Touch the **View** button in the conductivity Setup screen

You can only log 1000 data points at a time. To clear space for new data points, you have to delete the same number of old data points as you want to add new data points.

Function buttons on View Stored Data Screen

Touch **OK** to go back to the pH Setup screen from the View Stored Data screen.

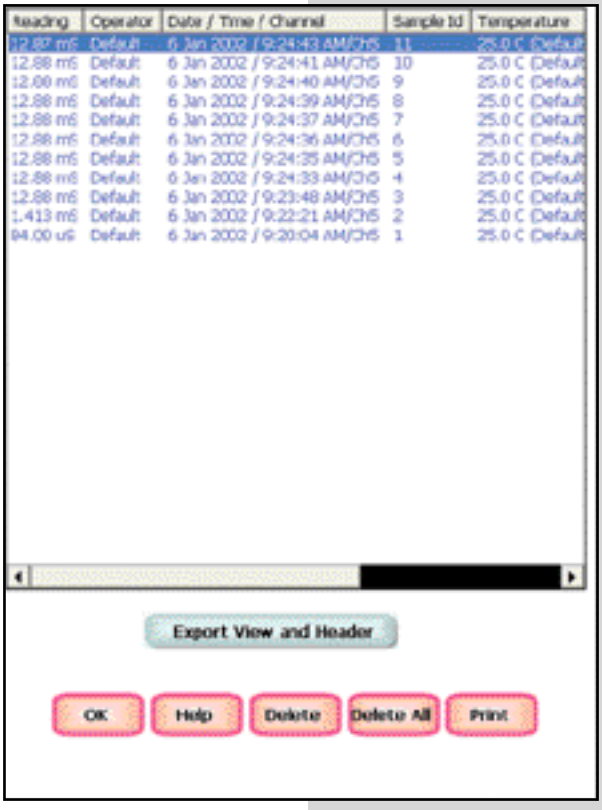
When you touch the **Help** button, information about the current screen appears. This information includes step-by-step instructions for operating the meter from the current screen and possible applications information for that screen.

Touch **Delete** to delete a selected data point from the list. To delete a data point, first touch the data point you want to delete then touch the **Delete** button.

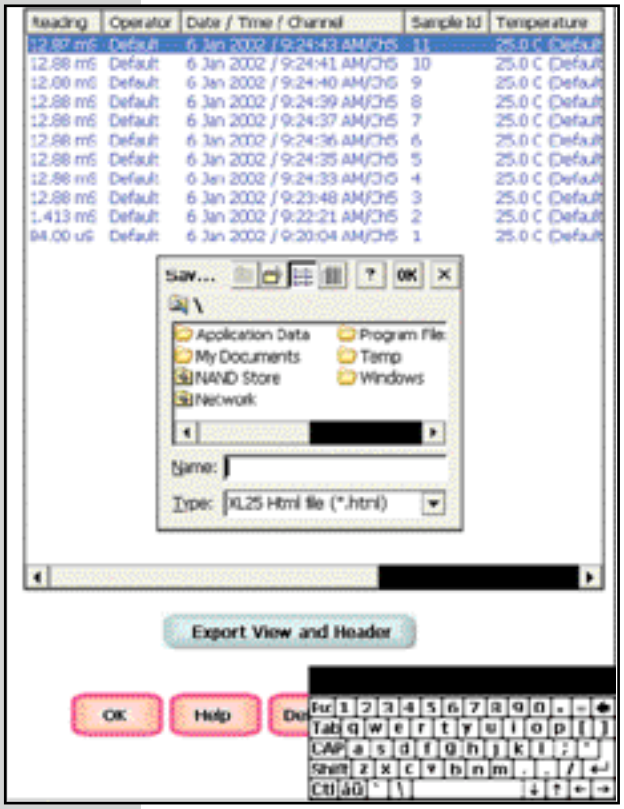
Touch **Delete All** to delete all the data point in the memory.

Touch **Print** to print all the data points in the memory.

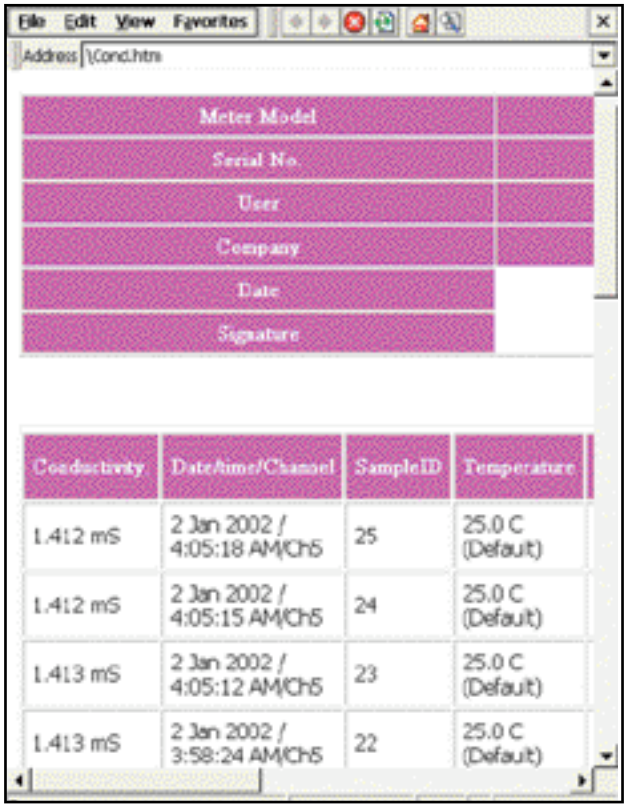
See next page for **Export View and Header** explanation.


Reading
Operator
Date / Time / Channel
Sample Id
Temperature
12.87 mS Default 6 Jan 2002 / 9:24:43 AM/CH5 11 25.0 C Default
12.88 mS Default 6 Jan 2002 / 9:24:41 AM/CH5 10 25.0 C Default
12.88 mS Default 6 Jan 2002 / 9:24:40 AM/CH5 9 25.0 C Default
12.88 mS Default 6 Jan 2002 / 9:24:39 AM/CH5 8 25.0 C Default
12.88 mS Default 6 Jan 2002 / 9:24:37 AM/CH5 7 25.0 C Default
12.88 mS Default 6 Jan 2002 / 9:24:36 AM/CH5 6 25.0 C Default
12.88 mS Default 6 Jan 2002 / 9:24:35 AM/CH5 5 25.0 C Default
12.88 mS Default 6 Jan 2002 / 9:24:33 AM/CH5 4 25.0 C Default
12.88 mS Default 6 Jan 2002 / 9:23:48 AM/CH5 3 25.0 C Default
1.413 mS Default 6 Jan 2002 / 9:22:21 AM/CH5 2 25.0 C Default
84.00 uS Default 6 Jan 2002 / 9:20:04 AM/CH5 1 25.0 C Default
Export View and Header
OK
Help
Delete
Delete All
Print

Touch **Export View and Header** to save your data in HTML format. The file can be stored in either the Nand flash, SD Card or any of the other available locations as shown in the window. After having selected the path, touch the alphanumeric keypad to name your file.

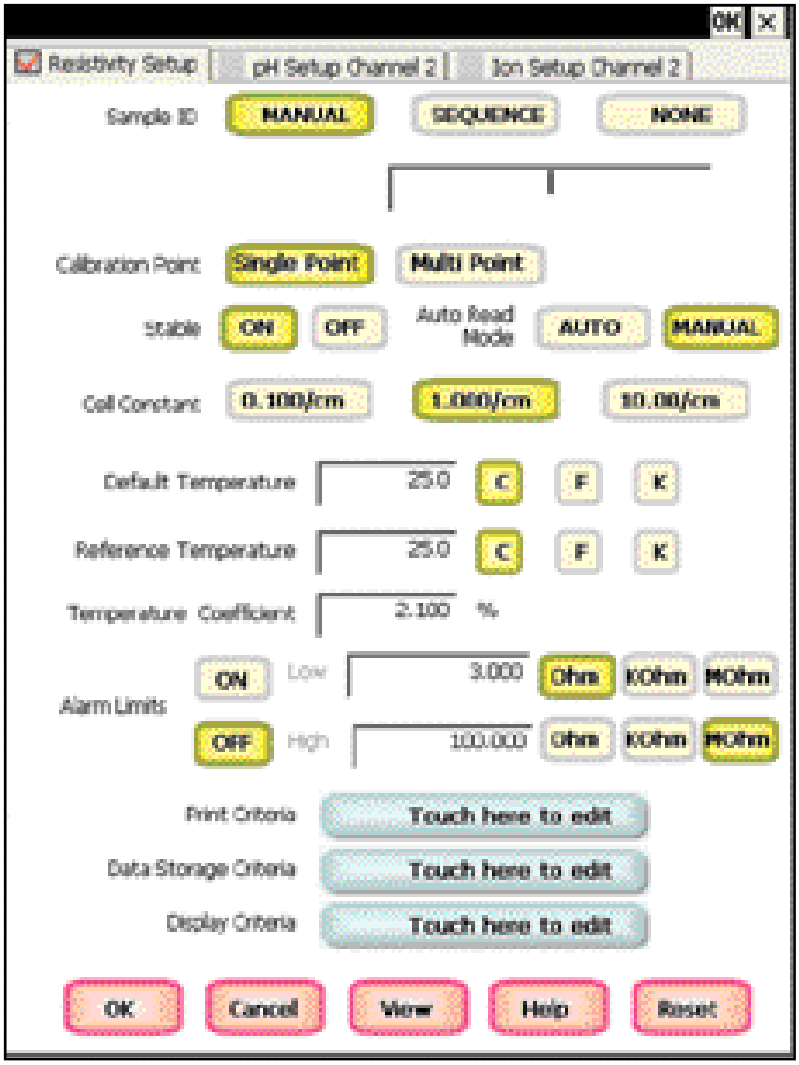


Touch the alphanumeric keypad to name your file.



Export view in HTML format

The resistivity Setup screen present many options to control the operating parameters of the meter. The meter is factory set with regard to these options, and is ready for use under most circumstances (see appendix page 122 for default settings). The operating parameters of the resistivity mode can be set and controlled from the resistivity setup screen. The resistivity Setup section will guide you through the various options available in the resistivity setup mode.



Function Buttons on Resistivity Setup Screen

Touch **OK** to confirm resistivity Setup and return to the resistivity Measure screen.

Touch **Cancel** to exit and return to the resistivity Measure screen without confirming resistivity Setup.

Touch **View** to view all resistivity data points stored in memory. See page 74 for details.

When you touch the **Help** button, information about the current screen appears. This information includes step-by-step instructions for operating the meter from the current screen and possible applications information for that screen.

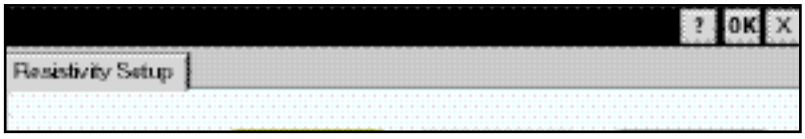
Touch **Reset** to reset all resistivity Setup Criteria to the factory default.

To access the Setup screen:

1. Make sure you are in the resistivity Measure screen (either dual display or single display; see page 22).
2. Touch the **Setup** button to access the resistivity Setup screen.

If you were in triple or dual display mode, you have access to the Setup mode for each channel displayed. Touch the **Setup Channel** buttons at the top of the screen to toggle back and forth between the setup screens for each channel. To change Resistivity parameters, select the Resistivity Setup button.

If you were in single display mode, you will access the Setup mode for the single channel displayed only.



See page 23 for pH setup directions.

See page 35 for mV setup directions.

See page 44 for ion concentration setup directions.

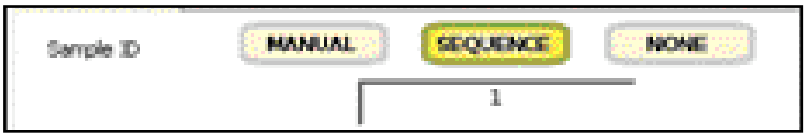
See page 57 for conductivity setup directions.

To Set Sample ID#

A sample ID is required if you wish to log data or activate a timed printing. Whenever this option is active, each time you touch **Log Data** on the resistivity Measure screen, the resistivity value along with date/time/channel and the sample ID will be sent to data storage.

You can manually enter an alphanumeric identification number of 10 characters for any sample or you can have the meter sequentially number your samples beginning at the number of your choice. You can also choose to deactivate the sample ID.

The resistivity Sample ID# is set the same way as previously described in Conductivity Setup. See page 59 for instructions.



To Set Calibration Point(s)

This option also allows you to choose single-point or multi-point standardardization. Use the single-point standardization option if you are measuring samples that close in value. Use the multi-point standardization option if you are measuring a wide range of samples. If a single point calibration is selected, there will be only one calibration factor for the entire range of operation. In the multi point mode, there will be one for each of the 4 ranges.

To select Calibration Point(s)

1. Touch **Single Point** or **Multi Point** to choose the method of standardization.

To Select Stable Indicator

This setup option lets you turn **ON** or **OFF** the stability indicator. When this function is turned on, the **STABLE** appears when the resistivity reading is stable.

To select Stable indicator

1. Touch **ON** or **OFF** to turn stable indicator on or off.

To Select Auto Read Mode

You can use this meter when the Auto Read function is active or when it is inactive. When the Auto Read function is active, the meter will lock onto a reading when the meter recognizes it as stable. The meter will not deviate from this reading until Measure is touched. If the Auto Read function is inactive, then the meter will continuously monitor any resistivity fluctuations.

To select Auto Read Mode

1. Touch **MANUAL** or **AUTO** to choose the desired read mode.

When you change cell constants your calibration factor will automatically reset to default values. It is recommended that you standardize your meter to establish a new calibration factor.

To Select Cell Constant

This setup option allows you to select the appropriate cell constant of the cell that you are using. There are three cell constants to choose from. Each is used for a different range of resistivity.

The Resistivity Cell Constant is set the same way as previously described in Conductivity Setup. See page 61 for instructions.

To Set Default Temperature

Resistivity is a temperature dependent measurement. This option allows you to select a default temperature that the meter will use along with the temperature coefficient to calculate a temperature corrected resistivity measurement. If an ATC probe is used any value entered as a default temperature will be overridden in favor of the actual measured temperature of the solution provided to the meter by the ATC probe.

The default temperature can be set from -10°C to 110°C.

The Resistivity Default Temperature is set the same way as previously described in Conductivity Setup. See page 62 for instructions.

To Set Reference Temperature

This setup option allows you to select the reference temperature to be used in the determination of the resistivity of your sample. The reference temperature is the temperature to which the resistivity readings would be normalized.

The reference temperature can be set from 15°C to 30°C.

The Resistivity Reference Temperature is set the same way as previously described in Conductivity Setup. See page 62 for instructions.

NOTE: The meter and probe with ATC will measure temperature even if the temperature coefficient is set to 0.0%, however a temperature correction will not be applied to the measurement.

To Set Temperature Coefficient

The temperature coefficient is a value that reflects the degree to which the sample's resistivity is effected by temperature changes. The meter will use the set temperature coefficient along with the measured temperature provided by the ATC probe to calculate what the resistivity would be at the selected reference temperature. If no ATC probe is being used, the meter will use the set default temperature in the calculation.

The temperature coefficient can be set from 0 to 10.000%.

The Resistivity Temperature Coefficient is set the same way as previously described in Conductivity Setup. See page 63 for instructions.

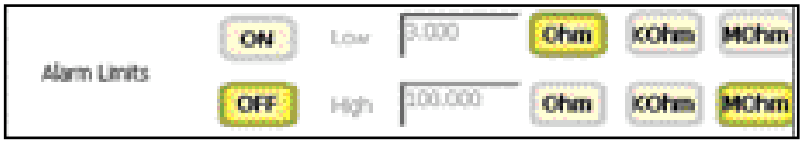
To Set Alarm Limits

This option allows you to set alarm limits for the resistivity measuring mode. If the resistivity value of the measurement is outside of the boundaries set by the minimum and maximum limits, audible and visual warnings will let you know that your sample measurement was outside of the set limits.

The Alarm Limit can be set from 3.000 Ohm to 100.000 M Ohm.

To set Alarm Limits

1. Touch **ON** or **OFF** to set the status of the alarm of resistivity mode
2. Touch the **Low box** and use numeric keypad to enter the new limit values.
3. Touch **Enter** on the keypad to accept this limit and return to the resistivity Setup screen.
4. Touch **Ohm, KOhm** or **MOhm** to select resistivity units of low alarm value.
5. Touch the **High box** and use numeric keypad to enter the new limit values.
6. Touch **Enter** on the keypad to accept this limit and return to the resistivity Setup screen.
7. Touch **Ohm, KOhm** or **MOhm** to select resistivity units of high alarm value.



To Set Print Criteria

This screen allows you to select which criteria are printed with the measurement when you print the data.. The status of the current print criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option. Any active criteria will be printed on demand.

The Resistivity Print Criteria is set the same way as previously described in Conductivity Setup. See page 64 for instructions.

To Set Data Storage Criteria

This screen allows you to select which criteria are stored in the data logger with the measurement when you store the data. The status of the current data storage criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option. Any active criteria will be stored on demand.

The Resistivity Data Storage Criteria is set the same way as previously described in Conductivity Setup. See page 65 for instructions.

To Set Display Criteria

This screen allows you to choose what information you would like to be displayed on the resistivity Measure screen, particularly the information contained in the data box at the bottom of the Measurement screen. The status of the current display criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option.

The Resistivity Display Criteria is set the same way as previously described in Conductivity Setup. See page 66 for instructions.

To View Stored Data

The XL50 has a memory capacity to store up to 1000 data points. The View Stored Data screen allows you to sort and look at specific data points stored in the meter based on the meters memory capacity. The stored data can be sorted by any of the parameters available in the screen header.

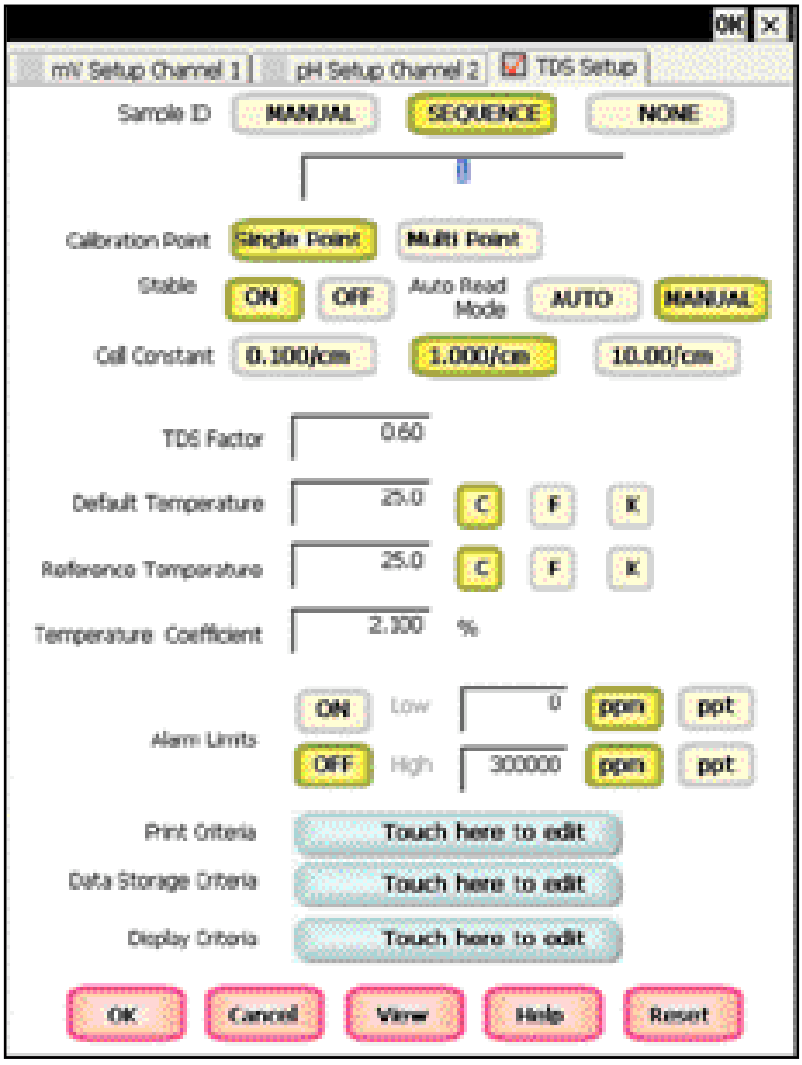
The meter stores resistivity data under the following parameters:

- Reading
- Operator
- Date / Time / Channel
- Sample Id
- Temperature
- Last Standardizations
- Meter Model Serial No.

Viewing Stored Resistivity Data is done the same way as previously described in Conductivity Setup. See pages 66-68 for instructions.

Fisher Scientific

The TDS Setup screen present many options to control the operating parameters of the meter. The meter is factory set with regard to these options, and is ready for use under most circumstances (see appendix page 122 for default settings). The operating parameters of the TDS mode can be set and controlled from the TDS setup screen. The TDS Setup section will guide you through the various options available in the TDS setup mode.



Function Buttons on TDS Setup Screen

Touch **OK** to confirm TDS Setup and return to the TDS Measure screen.

Touch **Cancel** to exit and return to the TDS Measure screen without confirming TDS Setup.

Touch **View** to view all TDS data points stored in memory. See page 80 for details.

When you touch the **Help** button, information about the current screen appears. This information includes step-by-step instructions for operating the meter from the current screen and possible applications information for that screen.

Touch **Reset** to reset all TDS Setup Criteria to the factory default.

To access the Setup screen:

1. Make sure you are in the TDS Measure screen (either dual display or single display; see page 22).
2. Touch the **Setup** button to access the TDS Setup screen.

If you were in triple or dual display mode, you have access to the Setup mode for each channel displayed. Touch the **Setup Channel** buttons at the top of the screen to toggle back and forth between the setup screens for each channel. To change TDS parameters, select the TDS Setup button.

If you were in single display mode, you will access the Setup mode for the single channel displayed only.

See page 23 for pH setup directions.

See page 35 for mV setup directions.

See page 44 for ion concentration setup directions.

See page 57 for conductivity setup directions.

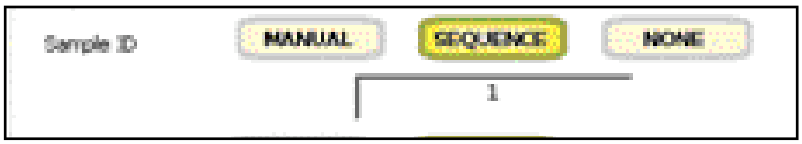
Fisher Scientific

To Set Sample ID#

A sample ID is required if you wish to log data or activate a timed printing.Whenever this option is active, each time you touch **Log Data** on the TDS Measure screen, the TDS value along with date/time/channel and the sample ID will be sent to data storage.

You can manually enter an alphanumeric identification number of 10 characters for any sample or you can have the meter sequentially number your samples beginning at the number of your choice. You can also choose to deactivate the sample ID.

The TDS Sample ID# is set the same way as previously described in Conductivity Setup. See page 59 for instructions.

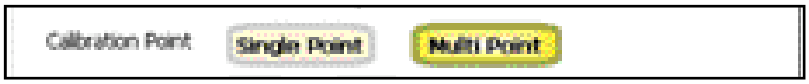


To Set Calibration Point(s)

This option also allows you to choose single-point or multi-point standardardization. Use the single-point standardization option if you are measuring samples that close in value. Use the multi-point standardization option if you are measuring a wide range of samples. If a single point calibration is selected, there will be only one calibration factor for the entire range of operation. In the multi point mode, there will be one for each of the 4 ranges.

To select Calibration Point(s)

1. Touch **Single Point** or **Multi Point** to choose the method of standardization.



To Select Stable Indicator

This setup option lets you turn **ON** or **OFF** the stability indicator. When this function is turned on, the **STABLE** appears when the TDS reading is stable.

To select Stable indicator

1. Touch **ON** or **OFF** to turn stable indicator on or off.

To Select Auto Read Mode

You can use this meter when the Auto Read function is active or when it is inactive. When the Auto Read function is active, the meter will lock onto a reading when the meter recognizes it as stable. The meter will not deviate from this reading until Measure is touched. If the Auto Read function is inactive, then the meter will continuously monitor any TDS fluctuations.

To select Auto Read Mode

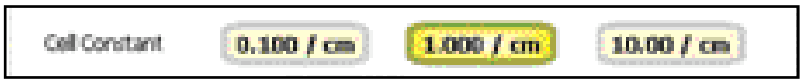
1. Touch **MANUAL** or **AUTO** to choose the desired read mode.

When you change cell constants your calibration factor will automatically reset to default values. It is recommended that you standardize your meter to establish a new calibration factor.

To Select Cell Constant

This setup option allows you to select the appropriate cell constant of the cell that you are using. There are three cell constants to choose from. Each is used for a different range of TDS.

The TDS Cell Constant is set the same way as previously described in Conductivity Setup. See page 61 for instructions.



To Set TDS Factor

A TDS conversion factor is needed when a solution does not have a similar ionic content to natural water or salt water. The TDS conversion factor automatically adjusts the reading.

The TDS conversion factor can be set from 0.40 to 1.00.

To set TDS Factor

1. Touch the **TDS Factor box** and use the numeric keypad to enter the desired default temperature (0.40 to 1.00).
3. Press **Enter** in the keypad to return to TDS Setup screen.

To Set Default Temperature

TDS is a temperature dependent measurement. This option allows you to select a default temperature that the meter will use along with the temperature coefficient to calculate a temperature corrected TDS measurement. If an ATC probe is used any value entered as a default temperature will be overridden in favor of the actual measured temperature of the solution provided to the meter by the ATC probe.

The default temperature can be set from -10°C to 110°C.

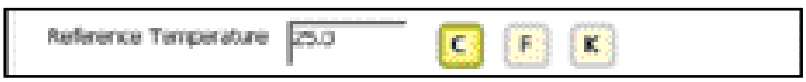
The TDS Default Temperature is set the same way as previously described in Conductivity Setup. See page 62 for instructions.

To Set Reference Temperature

This setup option allows you to select the reference temperature to be used in the determination of the TDS of your sample. The reference temperature is the temperature to which the TDS readings would be normalized.

The reference temperature can be set from 15°C to 30°C.

The TDS Reference Temperature is set the same way as previously described in Conductivity Setup. See page 62 for instructions.



Fisher Scientific

To Set Temperature Coefficient

The temperature coefficient is a value that reflects the degree to which the sample's TDS is effected by temperature changes. The meter will use the set temperature coefficient along with the measured temperature provided by the ATC probe to calculate what the TDS would be at the selected reference temperature. If no ATC probe is being used, the meter will use the set default temperature in the calculation.

The temperature coefficient can be set from 0 to 10.000%.

The TDS Temperature Coefficient is set the same way as previously described in Conductivity Setup. See page 63 for instructions.

NOTE: The meter and probe with ATC will measure temperature even if the temperature coefficient is set to 0.0%, however a temperature correction will not be applied to the measurement.

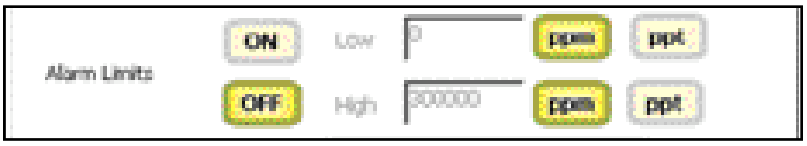
To Set Alarm Limits

This option allows you to set alarm limits for the TDS measuring mode. If the TDS value of the measurement is outside of the boundaries set by the minimum and maximum limits, audible and visual warnings will let you know that your sample measurement was outside of the set limits.

The Alarm Limit can be set from 0.00 to 500.00 ppt (depending upon TDS factor).

To set Alarm Limits

1. Touch **ON** or **OFF** to set the status of the alarm of TDS mode
2. Touch the **Low box** and use numeric keypad to enter the new limit values.
3. Touch **Enter** on the keypad to accept this limit and return to the TDS Setup screen.
4. Touch **PPM** or **PPT** to select TDS units of low alarm value.
5. Touch the **High box** and use numeric keypad to enter the new limit values.
6. Touch **Enter** on the keypad to accept this limit and return to the TDS Setup screen.
7. Touch **PPM** or **PPT** to select TDS units of high alarm value.



To Set Print Criteria

This screen allows you to select which criteria are printed with the measurement when you print the data.. The status of the current print criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option. Any active criteria will be printed on demand.

The TDS Print Criteria is set the same way as previously described in Conductivity Setup. See page 64 for instructions.

To Set Data Storage Criteria

This screen allows you to select which criteria are stored in the data logger with the measurement when you store the data .The status of the current data storage criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option. Any active criteria will be stored on demand.

The TDS Data Storage Criteria is set the same way as previously described in Conductivity Setup. See page 65 for instructions.

To Set Display Criteria

This screen allows you to choose what information you would like to be displayed on the TDS Measure screen, particularly the information contained in the data box at the bottom of the Measurement screen. The status of the current display criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option.

The TDS Display Criteria is set the same way as previously described in Conductivity Setup. See page 66 for instructions.

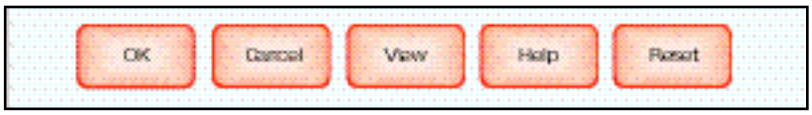
To View Stored Data

The XL50 has a memory capacity to store up to 1000 data points. The View Stored Data screen allows you to sort and look at specific data points stored in the meter based on the meters memory capacity. The stored data can be sorted by any of the parameters available in the screen header.

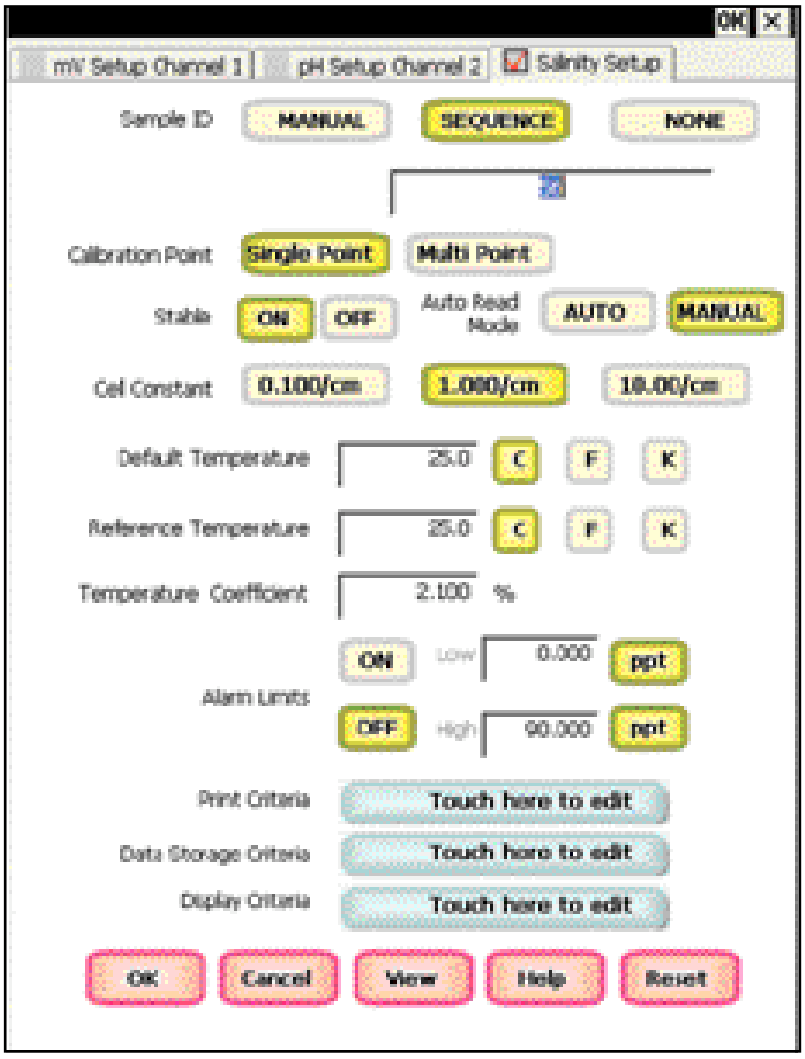
The meter stores TDS data under the following parameters:

- Reading
- Operator
- Date / Time / Channel
- Sample Id
- Temperature
- Last Standardizations
- Meter Model Serial No.

Viewing Stored TDS Data is done the same way as previously described in Conductivity Setup. See pages 67-68 for instructions.



The salinity Setup screen present many options to control the operating parameters of the meter. The meter is factory set with regard to these options, and is ready for use under most circumstances (see appendix page 122 for default settings). The operating parameters of the salinity mode can be set and controlled from the salinity setup screen. The salinity Setup section will guide you through the various options available in the salinity setup mode.



Function Buttons on Salinity Setup Screen

Touch **OK** to confirm salinity Setup and return to the salinity Measure screen.

Touch **Cancel** to exit and return to the salinity Measure screen without confirming salinity Setup.

Touch **View** to view all salinity data points stored in memory. See page 86 for details.

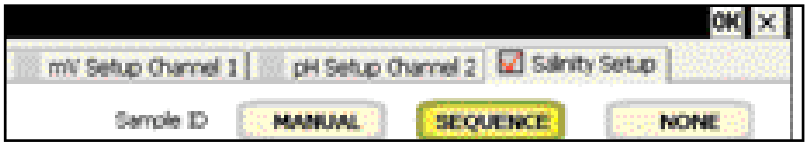
When you touch the **Help** button, information about the current screen appears. This information includes step-by-step instructions for operating the meter from the current screen and possible applications information for that screen.

Touch **Reset** to reset all salinity Setup Criteria to the factory default.

To access the Setup screen:

1. Make sure you are in the salinity Measure screen (either dual display or single display; see page 22).
2. Touch the **Setup** button to access the salinity Setup screen.

If you were in triple or dual display mode, you have access to the Setup mode for each channel displayed. Touch the **Setup Channel** buttons at the top of the screen to toggle back and forth between the setup screens for each channel. To change Salinity parameters, select the Salinity Setup button.



If you were in single display mode, you will access the Setup mode for the single channel displayed only.

See page 23 for pH setup directions.

See page 35 for mV setup directions.

See page 44 for ion concentration setup directions.

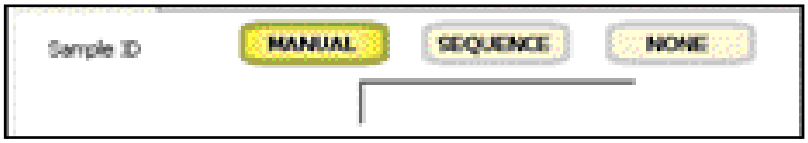
See page 57 for conductivity setup directions.

To Set Sample ID#

A sample ID is required if you wish to log data or activate a timed printing. Whenever this option is active, each time you touch **Log Data** on the salinity Measure screen, the salinity value along with date/time/channel and the sample ID will be sent to data storage.

You can manually enter an alphanumeric identification number of 10 characters for any sample or you can have the meter sequentially number your samples beginning at the number of your choice. You can also choose to deactivate the sample ID.

The Salinity Sample ID# is set the same way as previously described in Conductivity Setup. See page 59 for instructions.

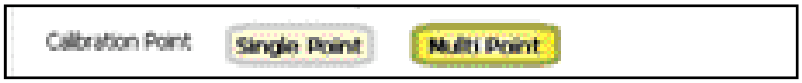


To Set Calibration Point(s)

This option also allows you to choose single-point or multi-point standardardization. Use the single-point standardization option if you are measuring samples that close in value. Use the multi-point standardization option if you are measuring a wide range of samples. If a single point calibration is selected, there will be only one calibration factor for the entire range of operation. In the multi point mode, there will be one for each of the 4 ranges.

To select Calibration Point(s)

1. Touch **Single Point** or **Multi Point** to choose the method of standardization.



To Select Stable Indicator

This setup option lets you turn **ON** or **OFF** the stability indicator. When this function is turned on, the **STABLE** appears when the salinity reading is stable.

To select Stable indicator

1. Touch **ON** or **OFF** to turn stable indicator on or off.

To Select Auto Read Mode

You can use this meter when the Auto Read function is active or when it is inactive. When the Auto Read function is active, the meter will lock onto a reading when the meter recognizes it as stable. The meter will not deviate from this reading until Measure is touched. If the Auto Read function is inactive, then the meter will continuously monitor any Salinity fluctuations.

To select Auto Read Mode

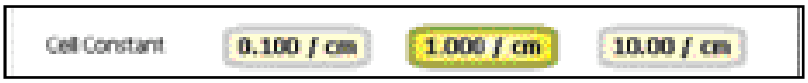
1. Touch **MANUAL** or **AUTO** to choose the desired read mode.

When you change cell constants your calibration factor will automatically reset to default values. It is recommended that you standardize your meter to establish a new calibration factor.

To Select Cell Constant

This setup option allows you to select the appropriate cell constant of the cell that you are using. There are three cell constants to choose from. Each is used for a different range of salinity.

The Salinity Cell Constant is set the same way as previously described in Conductivity Setup. See page 61 for instructions.

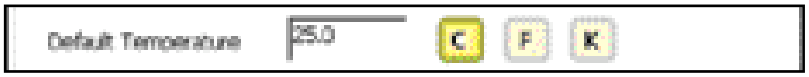


To Set Default Temperature

Salinity is a temperature dependent measurement. This option allows you to select a default temperature that the meter will use along with the temperature coefficient to calculate a temperature corrected salinity measurement. If an ATC probe is used any value entered as a default temperature will be overridden in favor of the actual measured temperature of the solution provided to the meter by the ATC probe.

The default temperature can be set from -10°C to 110°C.

The Salinity Default Temperature is set the same way as previously described in Conductivity Setup. See page 62 for instructions.

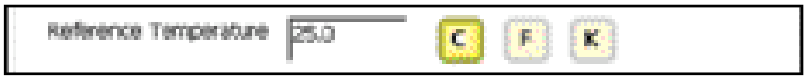


To Set Reference Temperature

This setup option allows you to select the reference temperature to be used in the determination of the salinity of your sample.

The reference temperature can be set from 15°C to 30°C.

The Salinity Reference Temperature is set the same way as previously described in Conductivity Setup. See page 62 for instructions.



NOTE: The meter and probe with ATC will measure temperature even if the temperature coefficient is set to 0.0%, however a temperature correction will not be applied to the measurement.

To Set Temperature Coefficient

The temperature coefficient is a value that reflects the degree to which the sample's salinity is effected by temperature changes. The meter will use the set temperature coefficient along with the measured temperature provided by the ATC probe to calculate what the salinity would be at the selected reference temperature. If no ATC probe is being used, the meter will use the set default temperature in the calculation.

The temperature coefficient can be set from 0 to 10.000%.

The Salinity Temperature Coefficient is set the same way as previously described in Conductivity Setup. See page 63 for instructions.

Fisher Scientific

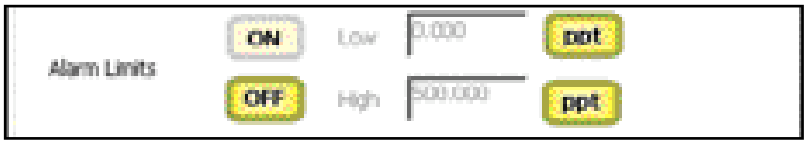
To Set Alarm Limits

This option allows you to set alarm limits for the salinity measuring mode. If the salinity value of the measurement is outside of the boundaries set by the minimum and maximum limits, audible and visual warnings will let you know that your sample measurement was outside of the set limits.

The Alarm Limit can be set from 0 to 90.000 ppt.

To set Alarm Limits

1. Touch **ON** or **OFF** to set the status of the alarm of salinity mode
2. Touch the **Low box** and use numeric keypad to enter the new limit values.
3. Touch **Enter** on the keypad to accept this limit and return to the salinity Setup screen.
4. Touch the **High box** and use numeric keypad to enter the new limit values.
5. Touch **Enter** on the keypad to accept this limit and return to the salinity Setup screen.



To Set Print Criteria

This screen allows you to select which criteria are printed with the measurement when you print the data. The status of the current print criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option. Any active criteria will be printed on demand.

The Salinity Print Criteria is set the same way as previously described in Conductivity Setup. See page 64 for instructions.

To Set Data Storage Criteria

This screen allows you to select which criteria are stored in the data logger with the measurement when you store the data. The status of the current data storage criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option. Any active criteria will be stored on demand.

The Salinity Data Storage Criteria is set the same way as previously described in Conductivity Setup. See page 65 for instructions.

To Set Display Criteria

This screen allows you to choose what information you would like to be displayed on the salinity Measure screen, particularly the information contained in the data box at the bottom of the Measurement screen. The status of the current display criteria is displayed on the screen. The criteria option is active if ***ON*** appears to the right of the option. It is inactive if ***OFF*** appears to the right of the option.

The Salinity Display Criteria is set the same way as previously described in Conductivity Setup. See page 66 for instructions.

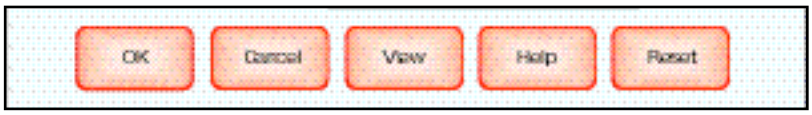
To View Stored Data

The XL50 has a memory capacity to store up to 1000 data points. The View Stored Data screen allows you to sort and look at specific data points stored in the meter based on the meters memory capacity. The stored data can be sorted by any of the parameters available in the screen header.

The meter stores salinity data under the following parameters:

- Reading
- Operator
- Date / Time / Channel
- Sample Id
- Temperature
- Last Standardizations
- Meter Model Serial No.

Viewing Stored Salinity Data is done the same way as previously described in Conductivity Setup. See pages 67-68 for instructions.



In pH Measurement mode, you will able to measure the pH of a wide variety of samples. Before measuring pH, you will need to standardize the meter using buffers with known pH values. It is good practice to standardize the meter frequently using a minimum of two buffers. Using two buffers allows the meter to calculate and display an actual slope for the electrode, and therefore produce more accurate measurements. If there is no standardization in the memory of the meter or if only one buffer has been used to standardize the meter, the slope value will appear as **"....."**.

You can standardize your meter using automatic or manual buffer recognition. With the Automatic buffer recognition activated (**ON**), the meter will automatically recognize the buffers from the chosen buffer group and flash the current buffer. When the reading is stable, you must confirm the buffer.

In the Manual buffer recognition mode, you must enter the buffer value during the standardization procedure. The meter will flash the manually entered buffer you must confirm the buffer when the reading is stable. During the standardization procedure, you may accept the buffer value before the meter recognizes it as stable by touching confirm. See the Setup section on page 27 to select desired buffer recognition.

Remember to setup your pH measuring mode parameters. Refer to pages 23-34 for pH Setup section instructions. Connect the electrodes you will be using to the meter.

Touch the Channel 1, 2, or 3 buttons (single pH channel screen) to access the standardization screen. Standardization is not available from the dual display mode.

pH measure screen without standardization

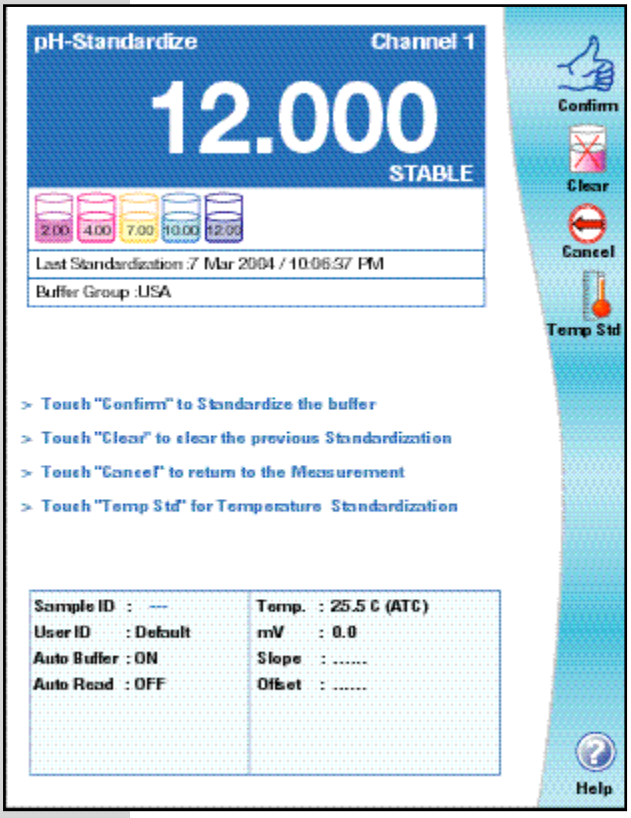
To Standardize the meter with Auto Buffer Recognition

1. Make sure Auto Buffer Recognition is selected in the Setup screen.
2. Immerse your rinsed electrode(s) and temperature probe in a buffer solution from the selected buffer group that you chose during the pH setup process and stir gently. The selected buffer group appears on the standardization screen.
3. Touch **Standardize** on the Channel 1, 2 or 3 pH measure screen to access the standardization screen.
4. Touch **Clear** if necessary to delete all previous standardization values. If the screen says **"Not standardized"** proceed to step **5**.
5. The screen will flash a beaker icon of the buffer solution you have selected. When the reading is stable, **STABLE** appears on the screen.
6. Touch **Confirm** to standardize the buffer. The meter will then return to the pH measure screen.
7. Touch **Standardize** on the pH measure screen to access the standardization screen. Repeat process to standardize with up to 5 buffers.

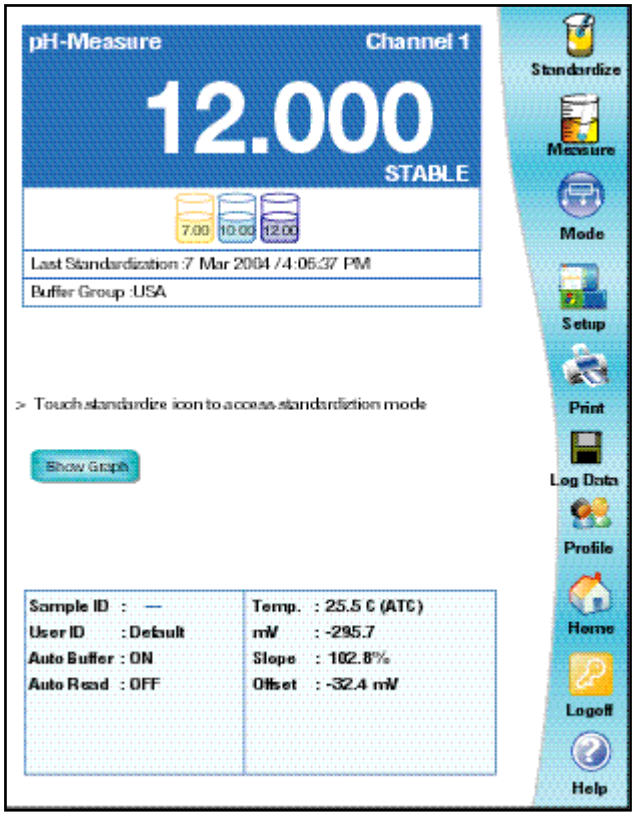
If there is no previous standardization, there is no need to click the Clear button. If your meter already has a calibration in the memory, use the Clear button if you need to clear the previous calibration values.

The efficiency of the electrode is reported as the slope. When doing a multi-point standardization, the slopes of the individual segment are calculated by the meter. The slope that appears on the screen is the slope applicable to that zone (in which the measurement is currently being made).

For optimal results, the meter should be standardized at a minimum of every 8 hours. For more accurate measurements, the meter should be standardized more frequently.



pH calibration screen with Auto Buffer Recognition



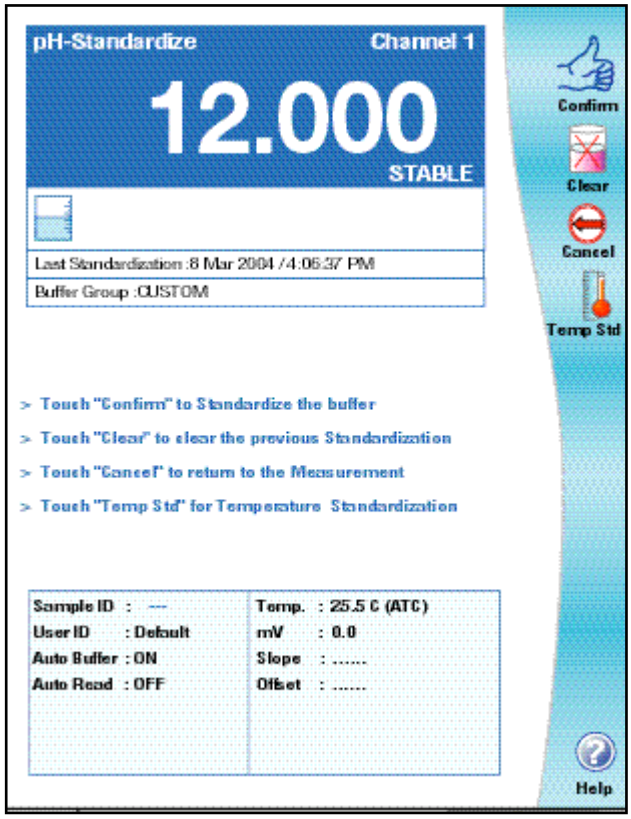
Once the meter is calibrated, the pH Measure screen shows the buffers that have been standardized and last standardization time/date

To standardize the meter with Manual Buffer Recognition

The Manual mode requires a minimum two-point calibration. When you press the Enter key after the first calibration point, a message appears: “Minimum 2 buffers need to be standardized to apply the standardization in measurement’.

1. Make sure Manual Buffer Recognition is selected in the Setup screen.
2. Immerse your rinsed electrode(s) and temperature probe in a buffer solution from the selected buffer group that you chose during the pH setup process and stir gently. The selected buffer group appears on the standardization screen.
3. Touch **Standardize** on the Channel 1, 2, or 3 pH measure screen to access the standardization screen.
4. Touch **Clear** if necessary to delete all previous standardization values. If the screen says **“Not standardized”** proceed to step **5**.
5. The screen will flash each beaker icon once, then a numberic keypad will appear. Using the displayed keypad input the value of the buffer that you are using to standardize the meter and then touch **Enter**. The meter now shows the buffer value in the flashing beaker.
6. When the reading is stable, **STABLE** appears on the screen. Touch **Confirm** to standardize the buffer. The meter will then return to the pH measure screen.
7. Touch **Standardize** on the pH measure screen to access the standardization screen. Repeat process to standardize with up to 5 buffers.

If there is no previous standardization, there is no need to click the Clear button. If your meter already has a calibration in the memory, use the Clear button if you need to clear the previous calibration values.

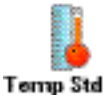


pH calibration screen with Manual Buffer Recognition

Once meter is calibrated, pH Measure screen shows the buffers that have been standardized and and last standardization time/date

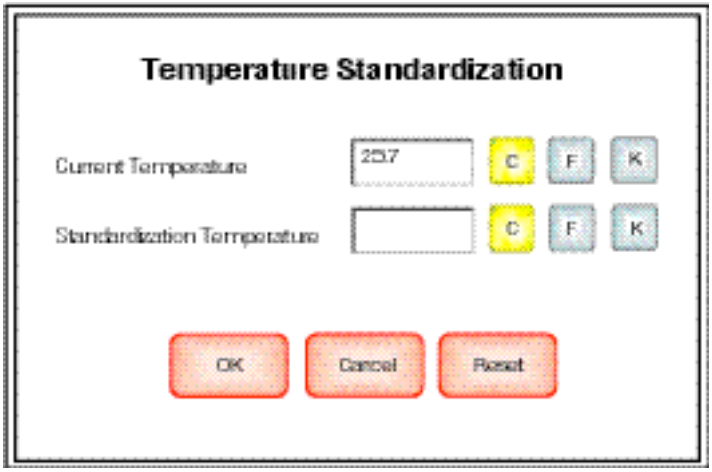
To Standardize Temperature of the Meter

1. Touch **Standardize** on the pH measure screen to access the standardized screen.
2. Immerse your ATC probe into a solution of known temperature, such as a temperature bath, for a few minutes while temperature stabilizes.
3. Make sure ATC probe is attached to meter.



4. Touch **Temp Std** to access temperature standardization
5. The Temperature Standardization screen appears. Check the current temperature displayed with that of the solution of known temperature. Touch the **Standardization Temperature** box and use numeric keypad to enter the current temperature. Press **Enter** to confirm value.
6. Touch **OK** to confirm Standardization Temperature and return to the pH Measure screen. Touch **Reset** to reset and enter a new standardization temperature. Touch **Cancel** to cancel temperature standardization and return to the pH Standardization screen.

Note: The meter will not allow entered value to exceed ±5° of the ATC probe value. If entered value exceeds ±5° an error window will appear and you will have to re-enter value or cancel out of the temperature screen. This might indicate that you have a a problem with the ATC probe.



The measure screen provides readout of the current sample measurement. You can use this meter when the Auto Read function is active or when it is inactive.

When the auto read function is active, the meter will lock onto a reading when the meter recognizes it as stable. The meter will not deviate from this reading until the Measure button is touched.

If the Auto Read mode is inactive, then the meter will continuously monitor the pH of the sample and the measure display screen will indicate any fluctuation in the sample pH. Regardless of the status of the Auto Read mode, **STABLE** will flash as the meter recognizes the measurement as stable.

Once the meter is standardized, you are ready to take pH measurements of your sample.

pH Measure screen with Auto Read OFF

To Measure pH of a Sample with Auto Read ON

1. Immerse the rinsed electrode(s) in the sample and stir gently.
2. Touch **Measure** to begin measuring your sample. The meter will accept the reading and display **STABLE** when the measurement meets the selected stability criteria.

OR

To Measure pH of a Sample with Auto Read OFF

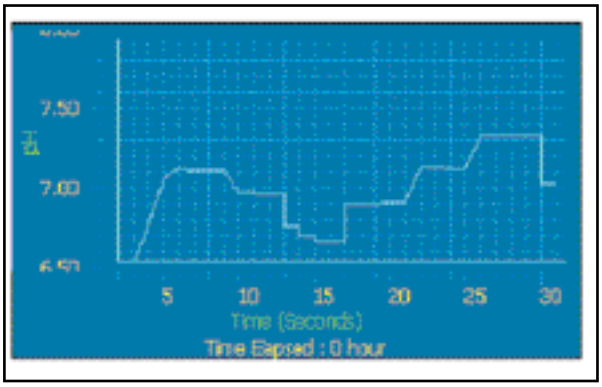
1. Immerse the rinsed electrode(s) in the sample and stir gently.
2. Record the reading once the measurement has become stable. **STABLE** will appear once the meter recognizes that the measurement is stable.

NOTES: You can access other functions of the meter with the remaining buttons on the measure screen.

- Touching **Setup** will access the pH Setup screen.
- Touching **Measure** will initiate a new measurement of a sample with Auto Read ON.
- At anytime, you can touch **Mode** to access another mode of operation.

You can view your data as a real-time graph on screen to display mV changes over time. Time is plotted in seconds. The graph refreshes every hour from the start of graphing.

1. To view your data in graph format, touch **Show Graph.**
2. To start plotting data, touch **Start Plotting.** To stop plotting data, touch **Stop Plotting.** Once the plotting is stopped, the displayed graph can be dragged left/right and up/down.
3. To view your data more closely, touch. **Zoom In**. To view more data at one time, touch **Zoom Out**.
4. To hide the graph, touch **Hide Graph.**



This mode is used to measure oxidation/ reduction potential (ORP/redox), perform titration and to verify the function of the meter.The mV measure function allows you to continuously monitor the mV potential of the electrodes in use. This can be done in either absolute or relative mV.

In the millivolts mode, the current millivolt output from the electrodes being used is monitored and displayed on the screen. The meter will continually monitor the millivolts reading in this mode and will not lock onto a single reading. However, once the reading has become stable, a **STABLE** will be displayed. Remember to setup your mV measuring mode parameter; see pages 35-43 for the mV Setup section.

Absolute mV measurement screen

Relative mV measurement screen

In the mV mode, you will be able to make measurements in either absolute or relative millivolts, access the mV Setup screens and print your results to a printer or a computer.

Connect the electrodes you will be using to the meter. See pages 8-9 for details.

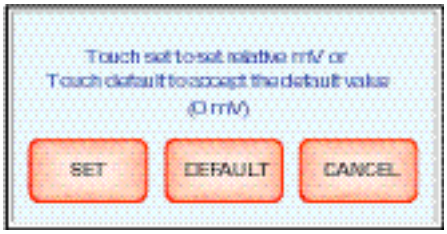
Absolute mV Measurements

1. Access the mV measure screen from the main screen
2. Immerse the rinsed electrode(s) in the sample and stir gently.
3. Record the measurement when **STABLE** is displayed.

Relative mV Standardization and Measurement

In the relative mV mode, we have an option either to adjust the displayed value within a ±150 mV window or equate it to zero.

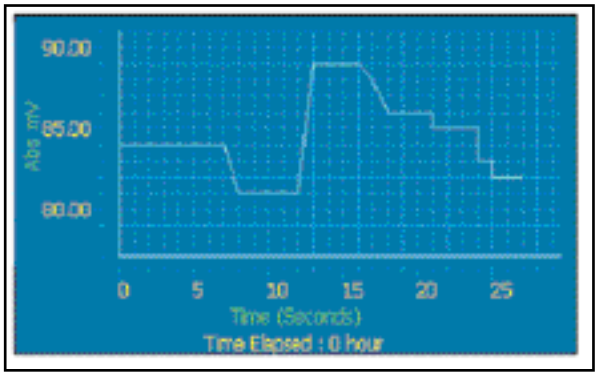
1. Access the mV Measure screen from the main screen.
2. Immerse the rinsed electrode(s) in the mV (ORP) standard solution and wait for **STABLE** to appear.
3. Touch **rel mV** to access the Relative mV screen. When **rel mV** is touched, a dialog box appears.
4. Touch **SET** to set relative mV using numeric keypad and press **Enter** to confirm value.
   OR
   Touch **DEFAULT** to accept the default value (0 mV)
   OR
   Touch **CANCEL** to cancel and return to previous screen.
5. The meter is now ready to take relative mV measurements.



Rinse the electrode with water and shake dry. Do not wipe the electrode. Wiping the electrode can cause a static charge on the glass bulb that will result in inaccurate readings.

You can view your data as a real-time graph on screen to display mV changes over time. Time is plotted in seconds. The graph refreshes every hour from the start of graphing.

1. To view your data in graph format, touch **Show Graph.**
2. To start plotting data, touch **Start Plotting.** To stop plotting data, touch **Stop Plotting.** Once the plotting is stopped, the displayed graph can be dragged left/right and up/down.
3. To view your data more closely, touch. **Zoom In**. To view more data at one time, touch **Zoom Out**.
4. To hide the graph, touch **Hide Graph.**



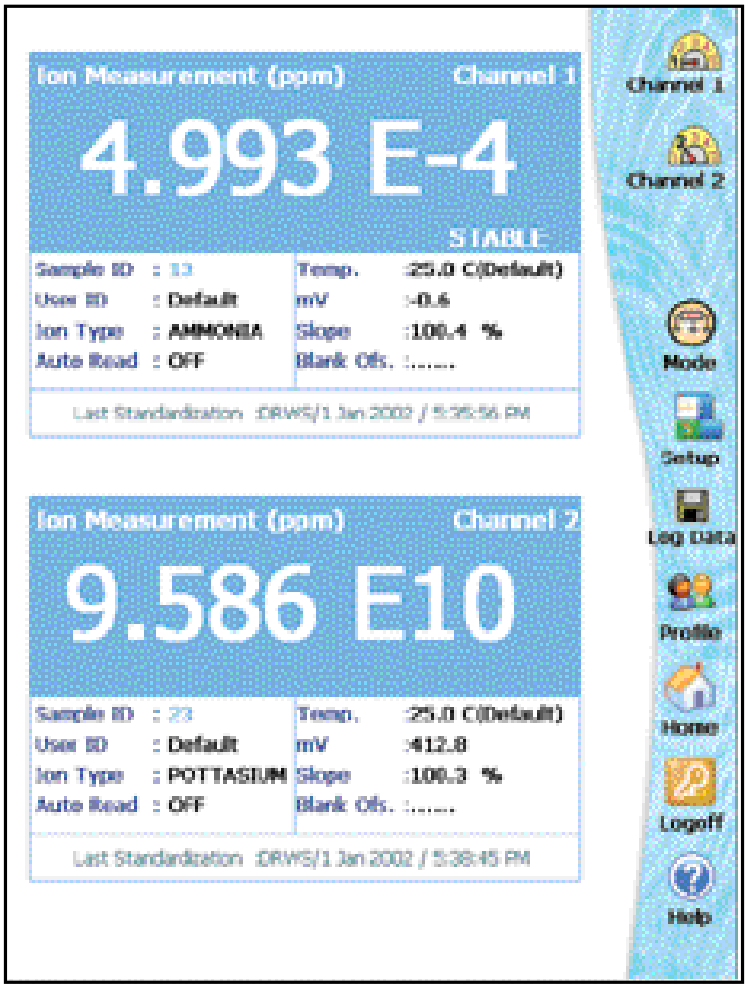
The accumet XL50 meter offes you unparalleled versatility with respect to ion analysis. You can choose:

- one of 6 methods of analysis
- the specific electrode you will be working with
- the units that you would like the meter to use when reporting the ion concentration

The Ion Measure screen displays the direct readout of sample concentration in the desired units, as well as the time and date of the last calibration. The standards used in the calibration and the slope of the electrode are also displayed on the screen. It is important to note that the concentration reported by the meter is actually the concentration of free uncomplexed ions in your solution.

Connect the electrodes you will be using to the meter. See pages 8-9 for details.

Remember to setup your Ion measuring mode parameters. Refer to pages 44-56 for Ion setup instructions.



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There are two direct reading methods:

Direct Reading with Standards and

Direct Reading with Blank Offset.

These types of measurements allow you to directly read the concentration of your sample after standardizing the meter with ion standards of known values or blank values.

Direct Reading with Standards

This is the most common method of ion measurement. You can directly read the concentration of the sample after standardizing the meter with ion standards. An ionic strength adjuster (ISA) is added to both the standards and the sample. Two to five standards are used to standardize the meter. The standards should bracket the expected value of the sample.

To Standardize the Meter Using Direct Reading with Standards

You must use a minimum of two standards to standardize the meter. Make sure you have selected "Direct Reading with Standards" on the Ion Setup screen.

1. Add ionic strength adjuster to your standard.
2. Immerse your rinsed electrode(s) into the standard solution and stir gently.
3. Touch the **Standardize** button on the Ion Measure screen to access the standardization screen.
4. Touch **Clear** if necessary to remove a previous standardization. If the screen says "Not Standardized," proceed to step 5.
5. The screen will flash each standard icon once, then a numberic keypad will appear. Using the displayed keypad input the value of the standard that you are using to standardize the meter. Touch **Enter** to accept this value. The meter now shows the value of the standard solution in the flashing beaker.
6. Wait until Stable appears on the screen. Press Confirm button once to confirm the standardization. To manually override the stability requriement, press Confirm before the stable message appears after the ion beaker starts flashing with the standard value.
7. Touch Standardize and repeat steps 3-7 with up to 5 standards. A minimum of two standards is required to standardize the meter in this mode.

Updating the standardization is not possible. Once five point standardization is complete, if you press the Standardize icon the meter will prompt the message to clear the previous standardization.

If the meter has not been standardized with at least two standards, a series of dashes will appear in place of a measurement value.

Measuring Ion Concentration in the Direct Reading with Standards mode

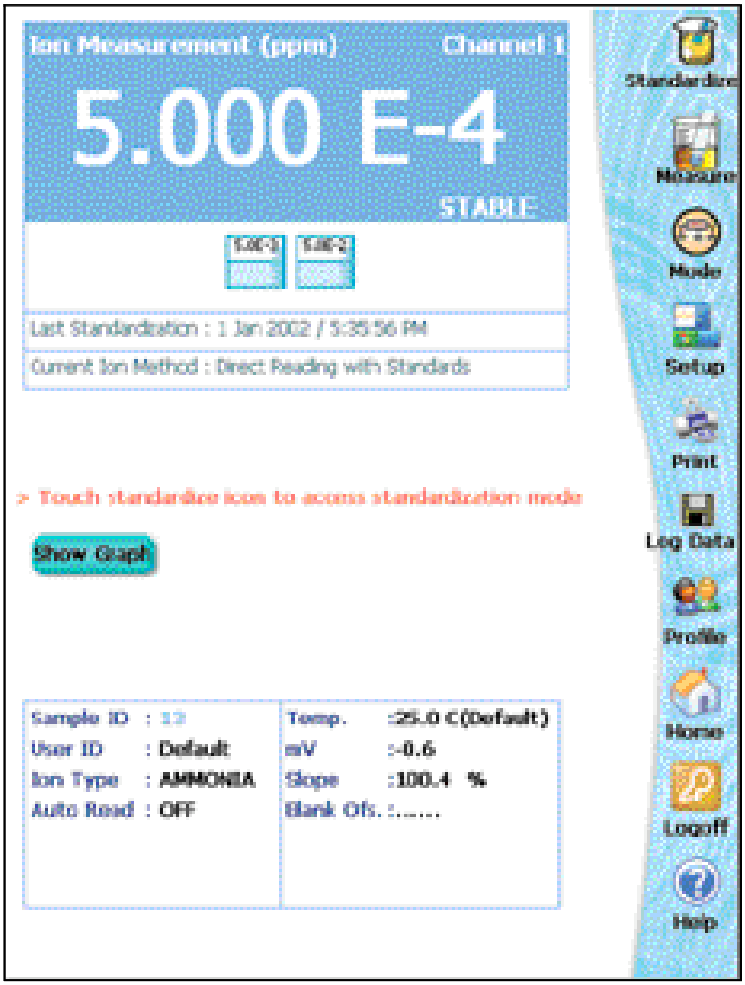
With Auto Read on

1. Add Ionic strength adjuster to the sample.
2. Immerse the ion selective electrode in the stirring sample.
3. Touch Measure to begin measuring your sample. The meter will accept the reading and display STABLE when the measurement meets the selected stability criteria. The measure screen will fix onto this measurement and will not deviate until meas is touched.

Repeat steps 1-3 with additional samples.

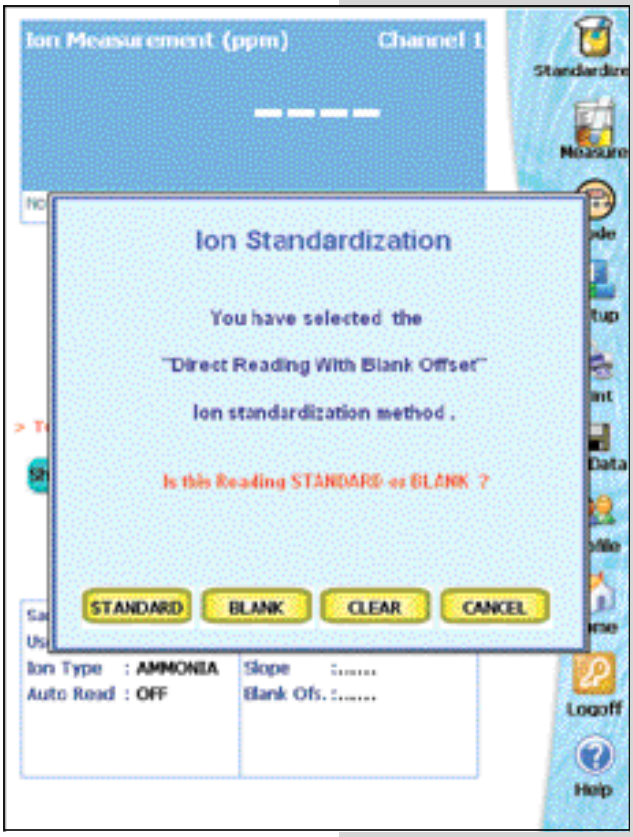
With Auto Read off

1. Add Ionic strength adjuster to the sample.
2. Immerse the ion selective electrode into the stirring sample. The meter will continually monitor the ion concentration value. When the meter recognizes the reading as stable, STABLE is displayed on the measure screen. With the Auto Read function deactivated, the display on the measure screen will indicate any deviation in the concentration.
3. Repeat steps 1-2 with additional samples.



Direct Reading with Blank Offset

This method presents you with the ability to measure samples with low level concentrations of the ion of interest. It eliminates background interference by subtracting the value of a blank concentration from the value for the sample.
See ISE Theory on page 128.



To Standardize the Meter Using Direct reading with Blank Offset

You will need to standardize the meter with one blank and a minimum of two standards. Make sure that you have selected "Direct Reading with Blank Offset" on the Ion Setup screen.

1. Add ionic strength adjuster to the standards and the blank.
2. Immerse the ion selective electrode in the blank or standard containing the lowest concentration of the ion of interest.
3. Stir the standard or blank.
4. Touch **Standardize** to initiate the standardization process. At this point, the meter will display the question "Is this reading standard or blank?"
5. Touch **STANDARD** if the sample that the electrode is immersed in is an Ion standard solution.

   OR

   Touch **BLANK** if the sample that the electrode is immersed in is the blank solution.

If you touched STANDARD

6. The Meter goes to the Standardization screen. The screen will flash each standard icon once, then a numberic keypad will appear. Using the displayed keypad input the value of the standard that you are using to standardize the meter. Touch Enter to accept this value.

   The meter accepts the value and starts blinking. When the Stable icon appears on the screen, press the Confirm icon to confirm the standardization.

If you touched BLANK

7. The meter will return to the Ion Measure screen and a beaker icon labeled blank will be displayed. The blank value will be displayed on the bottom display panel.

Repeat if the meter has not been standardized with at least 2 standards of known ion concentration.

Measuring Ion Concentration in the Direct Reading with Blank Offset Mode

With Auto Read on

1. Add ionic strength adjuster to the samples.
2. Immerse the ion selective electrode in the stirring sample
3. Touch **Measure.** When the meter recognizes the reading as stable, STABLE will appear on the screen. The value that appears on the screen is the value of the sample minus the value of the blank reading. The measure screen will fix on this measurement and will not deviate until meas is touched again.
4. Repeat steps 1-3 with additional samples. The meter will update the reading each time **Measure** is touched.

With Auto Read off

1. Add ionic strength adjuster to the sample.
2. Immerse the ion selective electrode in the stirring sample. The meter will continually monitor the ion concentration value. When the meter recognizes the reading as stable, STABLE is displayed on the measure screen. With the Auto Read function deactivated, the display on the measure screen will indicate any deviation in the concentration reading.

The incremental methods which include **known addition, known subtraction, analate addition and analate subtraction** are particularly useful with samples containing complex ionic backgrounds which cannot be matched in standards. They are also useful with occasional samples whose temperatures vary. More information on these methods is available in the ISE Theory Section (see page 128).

Standardizing the meter for all incremental methods

Prior to conducting an analysis using any of the incremental methods, it is necessary to standardize the meter with at least two standards. This will establish a slope value for the electrode in use. The slope value is required in the incremental method calculations which yield the ion concentration of the sample. See ISE Theory on page 128.

Make sure you have selected one of the incremental methods (known addition, known subtraction, analate addition, or analate subtraction) in the Ion Setup screen.

1. Add ionic strength adjuster to the standards.
2. Immerse the ion selective electrode in the stirring standard. Always begin standardization with the least concentrated ion standard.
3. Touch **Standardize** to initiate standardization.
4. Use the keypad to enter value of the standard.
5. Touch **Enter** on the keypad to accept this value. If you have entered value in error, touch **BS** to clear the value and key in a new value.
6. The meter accepts the value and the standard icon starts blinking. When the Stable icon appears on the screen, press the Confirm icon to confirm the standardization.
7. Repeatwith additional standards (up to five).

See pages 102-103 for Known Addition Measurement

See pages 104-105 for Known Subtraction Measurement

See pages 106-107 for Analate Addition Measurement

See pages 108-109 for Analate Subtraction Measurement

Measuring Concentration in Samples Using the Known Addition Method

When performing known addition, you will add an aliquot of standard solution containing the ionic species of interest to a known volume of your sample. The mV readings of the sample are taken before and after the addition of the standard. The concentration of the sample can then be calculated based upon the difference in the mV readings.

The use of the incremental methods requires that certain parameters be identified. In addition to the millivolt outputs of the electrode(s) in both the sample and the sample plus the standard, it is necessary to enter into the meter the volume of the sample, the volume of the standard, the volume of the Ionic Strength Adjuster (ISA) if used, the concentration of the standard and as previously stated the slope of the electrode in use.

Your accumet research meter will prompt you through the method, permitting you to enter the appropriate parameters at the appropriate time. When the meter has all of the data needed for the calculation, it will display the ion concentration of the sample as well as the parameters entered for the calculation.

The standard concentration should be high enough to nearly double the sample ion concentration after its addition. However, the standard volume should not significantly impact the sample volume. A 1:100 ratio of standard to sample ratio is optimal. For a monovalent electrode, the standard addition should result in a 15-30 mV change. For a divalent electrode, a 7-10 mV change is adequate. If the millivolt change is too high, the addition of the standard may affect the ionic strength and therefore the activity coefficients. This could result in inaccurate measurements. If the millivolt change is too small, readability errors are enhanced. See ISE Theory on page 128.

Taking a Known Addition Measurement

1. Immerse the ion selective electrode in a known volume of the sample solution.
2. Stir the sample.
3. Wait for the reading to stabilize (STABLE will appear). Touch **KA** to take the first mV reading of sample.
4. Add a known volume of standard solution to the sample.
5. Wait for the reading to stabilize (STABLE will appear). Touch **KA** to take the second mV reading of sample.
6. Use the keypad to enter the sample volume.
7. Touch **Enter** to accept the value.
8. Use the keypad to enter the standard volume.
9. Touch **Enter** to accept the value.
10. Use the keypad to enter the volume of ionic strength adjuster used. If no ISA was used, enter a value of zero.
11. Touch **Enter** to accept the value.
12. Use the keypad to enter the concentration of the standard solution added to the sample.
13. Touch **Enter** to accept the value. Your Known Addition result is now displayed.
14. Touch **Print** to send the data to a printer, or touch **Log Data** to log the data to memory (if a sample ID# has been assigned).

OR

Touch **OK** to return to the Measure screen for a new measurement.

Ion Measurement(mV)
Channel 1
-241.7
Last Standardization : 1 Jan 2002 / 5:53:10 PM
Current Ion Method : Known Addition
> Touch KA to take 1st reading using KNOWN ADDITION
> Touch standardize icon to access standardization mode
Show Graph
Sample ID : 12
User ID : Default
Ion Type : AMMONIA
Auto Read : OFF
Temp. :25.0 C(Default)
mV :-241.7
Slope :100.4 %
Blank Ofs. :-0.6 mV
Standardize
KN ADD
Mode
Setup
Print
Log Data
Profile
Home
Logoff
Help

Ion Measurement(mV)
Channel 1
Known Addition Result
15.3
ppm
Calculated Slope : 61.0 mV
Reading 1 : 12.2 mV
Reading 2 : 12.2 mV
Sample Volume : 100.0
Standard Volume : 10.0
ISA Volume : 50.0
Standard Concentration : 10.0
OK
PRINT
Standardize
KN ADD
Mode
Setup
Print
Log Data
Profile
Home
Logoff
Help

Measuring Concentration in Samples Using the Known Subtraction Method

The procedure for known subtraction is very similar to that for known addition method (see page 102). An aliquot of standard is added to a known volume of the sample. The difference is that the standard does not contain the same ionic species that you are trying to measure in the sample. Instead, it contains an ion that will complex or precipitate the ion of interest, removing it from the sample.

Like known addition, the mV readings are taken before and after the standard is added to the sample and the difference in mV values can be used to calculate the concentration of free ions of interest in the sample. This method will also require you to enter values of certain parameters in order to obtain an ion concentration. See ISE Theory on page 128.

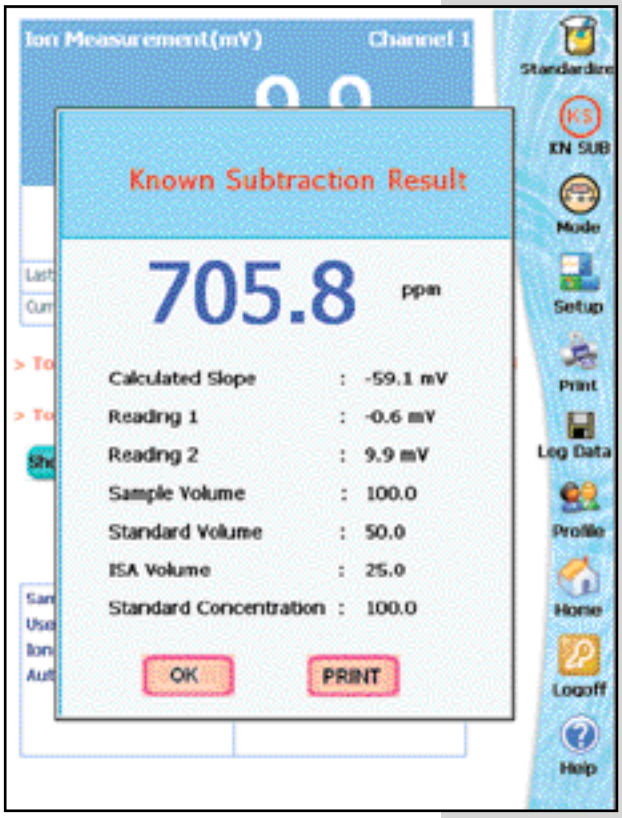
Taking a Known Subtraction Measurement

1. Immerse the ion selective electrode in a known volume of the sample solution.
2. Stir the sample.
3. Wait for the reading to stabilize (STABLE will appear). Touch **KS** to take the first reading.
4. Add a known volume of standard solution to the sample.
5. Wait for the reading to stabilize (STABLE will appear). Touch **KS** to take the second reading.
6. Use the keypad to enter the sample volume.
7. Touch **Enter** to accept the value.
8. Use the keypad to enter the standard volume.
9. Touch **Enter** to accept the value
10. Use the keypad to enter the volume of ionic strength adjuster used. If no ISA was used, enter a value of zero.
11. Touch **Enter** to accept the value.
12. Use the keypad to enter the concentration of the standard solution added to the sample.
13. Touch **Enter** to accept the value. Your Known Subtraction result is now displayed.
14. Touch **Print** to send the data to a printer, or touch **Log Data** to log the data to memory (if a sample ID# has been assigned).

OR

Touch **OK** to return to the Measure screen for a new measurement.

Ion Measurement(mV)
Channel 1
-241.7
STABLE
Blank
Last Standardization : 1 Jan 2002 / 5:53:18 PM
Current Ion Method : Known Subtraction
> Touch KS to take 1st reading using KNOWN SUBTRACTION
> Touch standardize icon to access standardization mode
Show Graph
Sample ID : 13
User ID : Default
Ion Type : AMMONIA
Auto Read : OFF
Temp. :25.0 C(Default)
mV :-241.7
Slope :100.4 %
Blank Ofs. :-0.6 mV
Standardize
KN SUB
Mode
Setup
Print
Log Data
Profile
Home
Logoff
Help


Ion Measurement(mV)
Channel 1
Known Subtraction Result
705.8
ppm
Calculated Slope : -59.1 mV
Reading 1 : -0.6 mV
Reading 2 : 9.9 mV
Sample Volume : 100.0
Standard Volume : 50.0
ISA Volume : 25.0
Standard Concentration : 100.0
OK
PRINT
Standardize
KN SUB
Mode
Setup
Print
Log Data
Profile
Home
Logoff
Help

Measuring Concentration in Samples Using the Analate Addition Method

The analate addition method is useful when your sample is at an elevated temperature and you want to negate the effect that temperature will have on the concentration calculation. This method is also useful if you have only a small amount of sample available.

The analate addition method differs only slightly from the known addition method (see page 102). The difference is the solution that you are taking your initial mV reading in is actually the standard and not the sample of interest. The difference in mV readings of the standard before and after the sample is added is used to calculate the concentration of the ion of interest. With the analate addition method, both the sample and the standard solution contain the ionic species of interest. See ISE Theory on page 128.

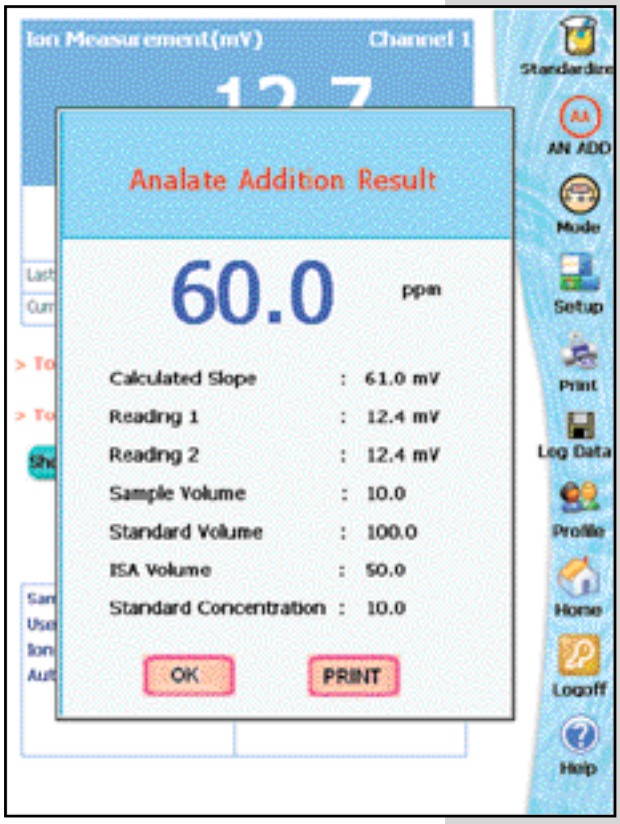
Taking an Analate Addition Measurement

1. Immerse the ion selective electrode in a known volume of the standard solution.
2. Stir the standard.
3. Wait for the reading to stabilize (STABLE will appear). Touch **AA** to take the first reading.
4. Add a known volume of sample solution to the standard solution
5. Wait for the reading to stabilize (STABLE will appear). Touch **AA** to take the second reading.
6. Use the keypad to enter the sample volume.
7. Touch **Enter** to accept the value.
8. Use the keypad to enter the standard volume.
9. Touch **Enter** to accept the value.
10. Use the keypad to enter the volume of ionic strength adjuster used. If no ISA was used, enter a value of zero.
11. Touch **Enter** to accept the value.
12. Use the keypad to enter the concentration of the standard solution.
13. Touch **Enter** to accept the value. Your Analate Addition result is now displayed.
14. Touch **Print** to send the data to a printer, or touch **Log Data** to log the data to memory (if a sample ID# has been assigned).

OR

Touch **OK** to return to the Measure screen for a new measurement.

Ion Measurement(mV)
Channel 1
-241.7
Last Standardization : 1 Jan 2002 / 5:52:10 PM
Current Ion Method : Analate Addition
> Touch AA to take 1st reading using ANALATE ADDITION
> Touch standardize icon to access standardization mode
Show Graph
Sample ID : 33
User ID : Default
Ion Type : AMMONIA
Auto Read : OFF
Temp. :25.0 C(Default)
mV :-241.7
Slope :100.4 %
Blank Ofs. :-0.6 mV
Standardize
AN ADD
Mode
Setup
Print
Log Data
Profile
Home
Logoff
Help


Ion Measurement(mV)
Channel 1
Analate Addition Result
60.0
ppm
Calculated Slope : 61.0 mV
Reading 1 : 12.4 mV
Reading 2 : 12.4 mV
Sample Volume : 10.0
Standard Volume : 100.0
ISA Volume : 50.0
Standard Concentration : 10.0
OK
PRINT
Standardize
AN ADD
Mode
Setup
Print
Log Data
Profile
Home
Logoff
Help

Measuring Concentration in Samples Using the Analate Subtraction Method

The analate subtraction method is useful when no ion specific electrode is available to measure the ion of interest directly. Like known subtraction the sample and the standard contain different ionic species. However, the ion being measured is in the standard and not in the sample. The reduction of free ions in the standard solution is proportional to the concentration of the ion of interest in the sample. See ISE Theory on page 128.

Taking an Analate Subtraction Measurement

1. Immerse the ion selective electrode in a known volume of the standard solution.
2. Stir the standard.
3. Wait for the reading to stabilize (STABLE will appear). Touch **AS** to take the first reading.
4. Add a known volume of sample solution to the standard.
5. Wait for the reading to stabilize (STABLE will appear). Touch **AS** to take the second reading.
6. Use the keypad to enter the sample volume.
7. Touch **Enter** to accept the value.
8. Use the keypad to enter the standard volume.
9. Touch **Enter** to accept the value.
10. Use the keypad to enter the volume of ionic strength adjuster used. If no ISA was used, enter a value of zero.
11. Touch **Enter** to accept the value.
12. Use the keypad to enter the concentration of the standard solution.
13. Touch enter to accept the value. Your Analate Subtraction result is now displayed.
14. Touch **Print** to send the data to a printer, or touch **Log Data** to log the data to memory (if a sample ID# has been assigned).

OR

Touch **OK** to return to the Measure screen for a new measurement.

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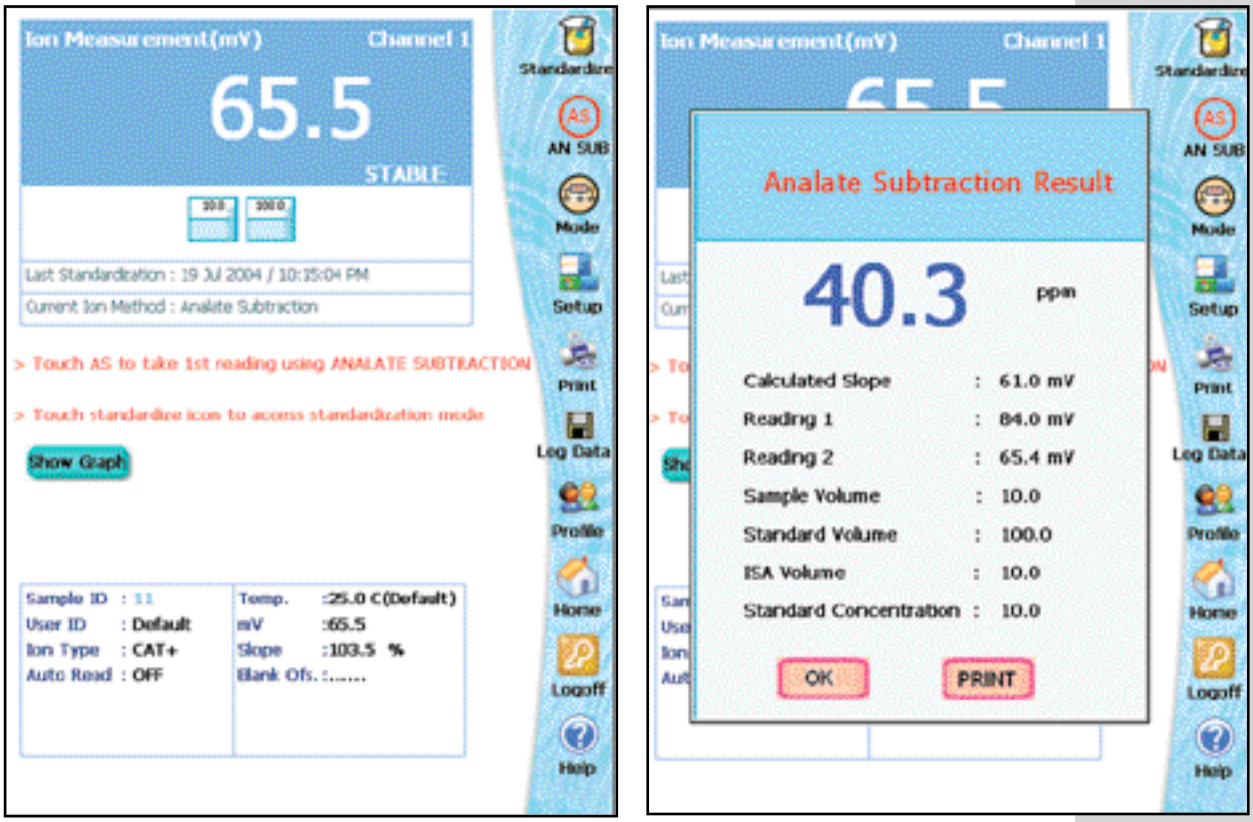
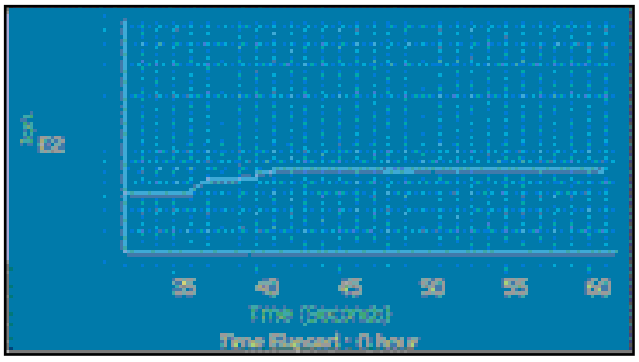

Ion Measurement(mV)
Channel 1
65.5
STABLE
Last Standardization : 19 Jul 2004 / 10:15:04 PM
Current Ion Method : Analate Subtraction
> Touch AS to take 1st reading using ANALATE SUBTRACTION
> Touch standardize icon to access standardization mode
Show Graph
Sample ID : 11
User ID : Default
Ion Type : CAT+
Auto Read : OFF
Temp. :25.0 C(Default)
mV :65.5
Slope :103.5 %
Blank Ofs. :.....
Standardize
AN SUB
Mode
Setup
Print
Log Data
Profile
Home
Logoff
Help
Analate Subtraction Result
40.3
ppm
Calculated Slope : 61.0 mV
Reading 1 : 84.0 mV
Reading 2 : 65.4 mV
Sample Volume : 10.0
Standard Volume : 100.0
ISA Volume : 10.0
Standard Concentration : 10.0
OK
PRINT

You can view your data as a real-time graph on screen to display ion concentration changes over time. The graph refreshes every hour from the start of graphing.

1. To view your data in graph format, touch **Show Graph.**
2. To start plotting data, touch **Start Plotting.** To stop plotting data, touch **Stop Plotting.** Once the plotting is stopped, the displayed graph can be dragged left/right and up/down.
3. To view your data more closely, touch. **Zoom In**. To view more data at one time, touch **Zoom Out**.
4. To hide the graph, touch **Hide Graph.**



This meter allows you to measure conductivity, resistivity, TDS (total dissolved solids) and salinity. Each mode is independent from one another and needs to be standardized separately. However the basic procedure for standardization and measurement is similar for each mode. This manual will focus on conductivity standardization and measurement with the variations for other modes noted.

Each measuring mode has four measuring ranges.

Conductivity: 0 to 200.0 µS, 200.0 µS to 2.000 mS, 2.000 to 20.00 mS, and 20.00 to 500.0 mS.

Resistivity: 0 to 20.00 KOhms, 20.00 to 200.0 KOhms, 200.0 KOhms to 2.000 MOhms, and 2.000 to 100.0 MOhms.

TDS: 0 to 200.0 x TDS factor ppm, 200.0 x TDS factor to 2000 x TDS factor ppm, 2.000 x TDS factor to 20.00 x TDS factor ppt, and 20.00 x TDS factor to 200.0 x TDS factor ppt.

Salinity: 0 to 0.094 ppt, 0.094 to 1.000 ppt, 1.000 to 11.50 ppt, and 11.50 to 90.00 ppt

Before measuring conductivity, resistivity, TDS or salinity, you will need to standardize the meter using standards with known conductivity, resistivity, TDS or salinity values. This meter can perform a single- or multi-point standardization. You will need to set your meter to single- or multi-point calibration in the Setup mode for conductivity, resistivity, TDS or salinity. You may also use the Setup mode set conductivity to auto standard recognition to recognize preset values (84 uS, 1.413 mS, 12.88 mS and 111.8 mS)

The meter will continually monitor the conductivity (resistivity, TDS or salinity) reading in this mode and will not lock onto a single reading. However, once the reading has become stable, **STABLE** will be displayed (unless the Stable indicator has been turned **OFF** in the Setup mode). Remember to setup your measuring mode parameters. Refer to the setup section for the particular mode you will be measuring.

Conductivity measure screen without standardization

To Standardize the meter with Auto Standard Recognition (Conductivity mode only)

1. Touch **Standardize** on the conductivity measure screen to access the standardize screen.
2. If the screen says **"Not standardized"** proceed to step **4**.
3. Touch **Clear** if you need to delete the the previous standardization values
4. Immerse your rinsed conductivity cell in a standard solution (84 uS, 1.413 ms, 12.88 mS or 111.8 mS) and stir gently. The immersion depth should be enough to cover the vent holes on the electrode.
5. The screen will flash a beaker icon of the standard solution you have selected. When the reading is stable, **STABLE** appears on the screen. Touch **Confirm** to standardize the buffer. The meter will then return to the conductivity measure screen.
6. If you selected **Single Point** in the Setup mode Calibration Point(s), your meter is now ready to measure conductivity with one standardization factor.
   OR
   If you selected Multi Point in the Setup mode Calibration Point(s), touch **Standardize** on the conductivity measure screen to access the standardization screen and repeat steps **4** through **6** to standardize with up to 4 points. Performing a multi point calibration will give your meter multiple standardization factors.

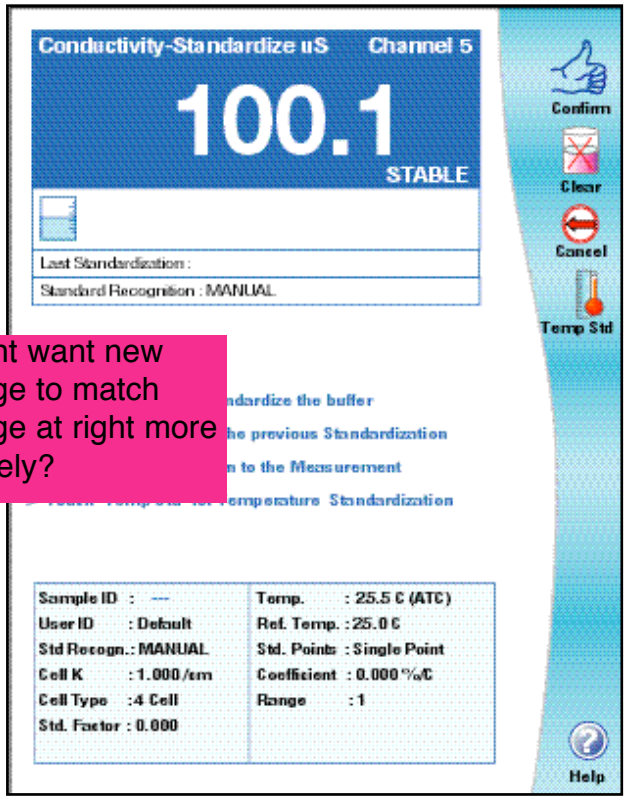
Conductivity standardization with Auto standard recognition (available in Conductivity Mode only)

Once meter is calibrated, the conductivity Measure screen shows the standards and the time/date of last standardization.

To standardize the meter with Manual Standard Recognition (available in all modes)

1. Touch **Standardize** on the conductivity measure screen to access the standardized screen.
2. If the screen says **"Not standardized"** proceed to step **4**.
3. Touch **Clear** if you need to delete the the previous standardization values
4. Immerse your rinsed conductivity cell in a standard solution and stir gently. The immersion depth should be enough to cover the vent holes on the electrode.
5. The screen will flash each beaker icon once, then a number keypad will appear. Using the displayed keypad input the value of the standard that you are using to standardize the meter and then touch **Enter**. The meter now shows the standard value in the flashing beaker.
6. When the reading is stable, **STABLE** appears on the screen. Touch **Confirm** to standardize the buffer. The meter will then return to the conductivity measure screen.
7. If you selected **Single Point** in the Setup mode Calibration Point(s), your meter is now ready to measure conductivity with one standardization factor.
   OR
   If you selected Multi Point in the Setup mode Calibration Point(s), touch **Standardize** on the conductivity measure screen to access the standardization screen and repeat steps **4** through **7** to standardize with up to 4 points. Performing a multi point calibration will give your meter multiple standardization factors.

It is important to condition your conductivity probe according to the manufacturer's instructions prior to use.



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Conductivity standardization with Manual standard recognition

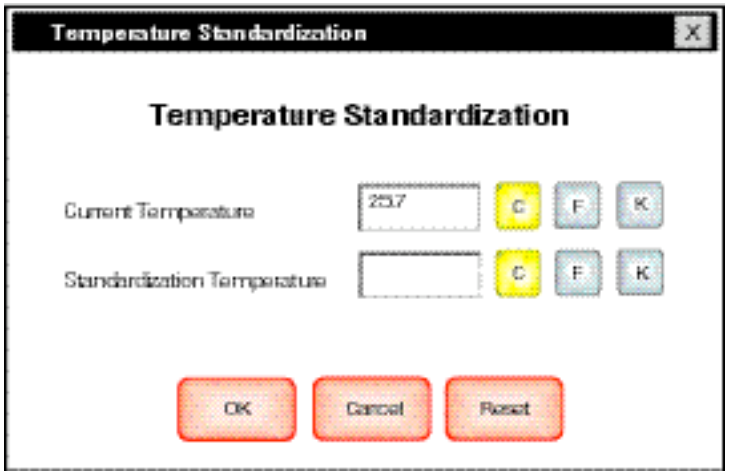
Once meter is calibrated, the conductivity Measure screen shows the standards and the time/date of last standardization.

To Standardize Temperature of the Meter

1. Touch **Standardize** on the conductivity measure screen to access the standardized screen.
2. Make sure conductivity cell with built ATC is attached to meter.
3. Immerse your conductivity cell with built ATC probe into a solution of known temperature, such as a temperature bath, for a few minutes while temperature stabilizes.

4. Touch **Temp Std** to access temperature standardization
5. The Temperature Standardization screen appears. Check the current temperature displayed with that of the solution of known temperature. Touch the **Standardization Temperature** box and use numeric keypad to enter the current temperature. Press **Enter** to confirm value.
6. Touch **OK** to confirm Standardization Temperature and return to the conductivity Measure screen. Touch **Reset** to reset and enter a new standardization temperature. Touch **Cancel** to cancel temperature standardization and return to the conductivity Standardization screen.

Note: The meter will not allow entered value to exceed ±5°C of the ATC probe value. If entered value exceeds ±5°C an error window will appear and you will have to re-enter value or cancel out of the temperature screen. This might indicate that you have a faulty ATC probe.



Once the meter is standardized, you are ready to take conductivity, resistivity, TDS or salinity measurements of your sample.

1. Immerse the rinsed conductivity cell with built in ATC into the sample solution. The immersion depth should be enough to cover the vent holes on the electrode.
2. Stir the solution with the electrode briefly and then let the electrode sit still in the solution.
3. Record the reading once the measurement has become stable. **STABLE** will appear once the meter recognizes that the measurement is stable. The meter will automatically change ranges from uS/cm to mS/cm as required.

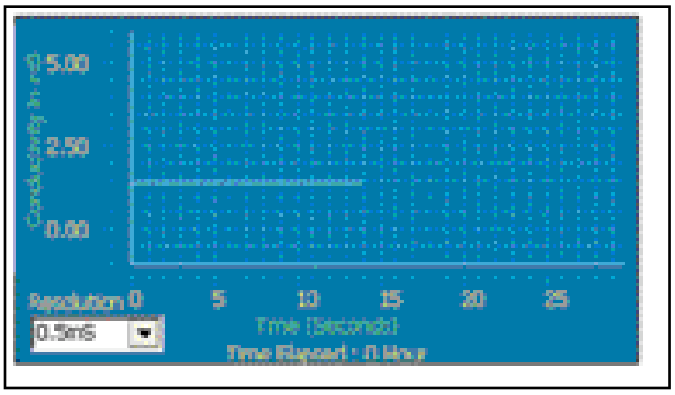
NOTES: You can access other functions of the meter with the remaining buttons on the measure screen.

- Touching **Print** will send the data to the meter's memory if the sample ID# is activated and to a printer or a computer if it is attached to the meter. The saved data can be accessed through the View Storage Data screen in the conductivity Setup mode.
- Touching **Setup** will access the conductivity Setup screen.
- At anytime, you can touch **Mode** to access another mode of operation including: resistivity, TDS, salinity or the setup mode.

Conductivity Measure screen with STABLE indicator ON

You can view your data as a real-time graph on screen to display conductivity changes over time. Time is plotted in seconds. The graph refreshes every hour from the start of graphing.

1. To view your data in graph format, touch **Show Graph.**
2. To start plotting data, touch **Start Plotting.** To stop plotting data, touch **Stop Plotting.** Once the plotting is stopped, the displayed graph can be dragged left/right and up/down.
3. To view your data more closely, touch. **Zoom In**. To view more data at one time, touch **Zoom Out**.
4. To hide the graph, touch **Hide Graph.**



Meter and Electrode Warranty Statement

The Fisher Scientific Company (“Fisher”) warrants to the direct purchaser that the accumet meters and Accumet, AccuTupH, AccuFET, AccupHast, and Microprobe electrodes will be free from defects in material or workmanship for a specified warranty period. During that period, Fisher will repair or replace the product or provide credit, at its sole option, upon prompt notification and compliance with its instructions. For accumet meters, that specified period is 24 months from delivery date. For electrodes, that specified period is 12 months - except for models 13-620-532, 13-620-533, 13-620-534, 13-620-535, 13-620-536, 13-620-537, 13-620-538 and 13-620-539 - which are warranted for six months.

Unless otherwise agreed, the warranty is limited to the country in which the product is sold.

No Fisher employee, agent or representative has the authority to bind Fisher to any oral representation or warranty concerning any product sold. Any oral representation or warranty made prior to purchase of any product and not set forth in writing and signed by a duly authorized officer of Fisher shall not be enforceable by the purchaser.

FISHER EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Fisher’s sole responsibility and the purchaser’s exclusive remedy for any claim arising out of the purchase of any product listed above is repair, replacement or credit as described above, where applicable. In no event: 1) shall the cost of the exclusive remedy exceed the purchase price: 2) shall Fisher be liable for any special, indirect, incidental, consequential, or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Each article that Fisher furnishes will conform to the written specifications given in this manual, or those of a further improved model. Changes are made often to the information in the manual and will be incorporated into future editions.

Notice of Compliance

WARNING: This meter generates, uses, and can radiate radio frequency energy. If not installed and used properly, that is in strict accordance with the manufacturer’s instructions, it may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

This product is to be used only as described in the manual. This product is for indoor use only, and must be used in a well ventilated area.

WARNING: To meet or exceed FCC regulations and comply with CE requirements, the Fisher-supplied power supply must be used. Use of a power supply that is not approved by Fisher Scientific may cause safety hazards and/or cause unit to exceed EMC limits and/or damage unit. When using this meter with a computer or printer, a shielded RS232 cable must be used to meet or exceed FCC regulations, and comply with CE Mark requirements.

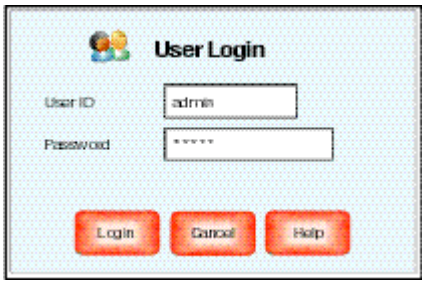
The XL50 is equipped with a User Profiles setup or the User Profile Management Application. Setting user profiles saves an individual users unique Setup preferences, calibration data and stored data. The meter can be used without setting a user profile but it will recognize all users as **Default**.

Accessing User Profile Screen

1. Touch **Home** on any measurement or the Mode screen to access the Home screen.
2. Double tap on **AdminUser**. The **User Login** dialog box will appear.
3. Touch the **User ID** box. The alphanumeric keypad will appear. Key in your **User ID** or **"admin"**.

   To set up new users or delete users you must log in using the **"admin"** user ID.

   The **BS** key will allow you to backspace to remove a character that was incorrectly entered. Press the **Enter** key .



4. Touch the **Password** box, use the alphanumeric keypad on the screen to key in the password.

   NOTE: When entering the User Profiles setup for the first time use **admin** as the Password.

   Press the **Enter** key. The **User Login** screen will appear with User ID and Password entered.

5. Touch **Login** to enter the **User Profiles** screen.

From this screen you can update Password and Company Name information by tapping in the appropriate boxes, if you are logged in as a user. If you are logged in as "Admin" user ID you can add and delete users.

NOTE: The administrator has authority to add or delete user names. Users may modify their password and company name only by entering User ID and Password in place of Admin on the User Login screen.

Adding User Profiles

1. After logging in under User ID "**admin**" the User Detail fields will show information for "**Admin**". Touch **Clear** to clear all information from the **User detail** box to enter a new user. You can now begin entering information for new users
2. Touch the **User ID** box, use the alphanumeric keypad on the screen to key in the new User ID. The User ID cannot exceed 10 characters. Press **Enter** key to confirm User ID.
3. Touch the **Password** box, use the alphanumeric keypad on the screen to key in a Password. The Password cannot exceed 12 characters. Press **Enter** key to confirm Password.
4. Touch the **Confirm Password** box, use the alphanumeric keypad on the screen to key in the same password used in step **3**. Press **Enter** key to confirm Password.
5. Touch the **Company Name** box, use the alphanumeric keypad on the screen to key in the Company Name. Press **Enter** key to confirm Company name.
6. Touch **Add**, a dialog box will ask "Are you sure, you want to add this user?" Touch **Yes** or **No**. If you touch Yes, the new user will be added. If you touch **No**, you may still edit the current user.

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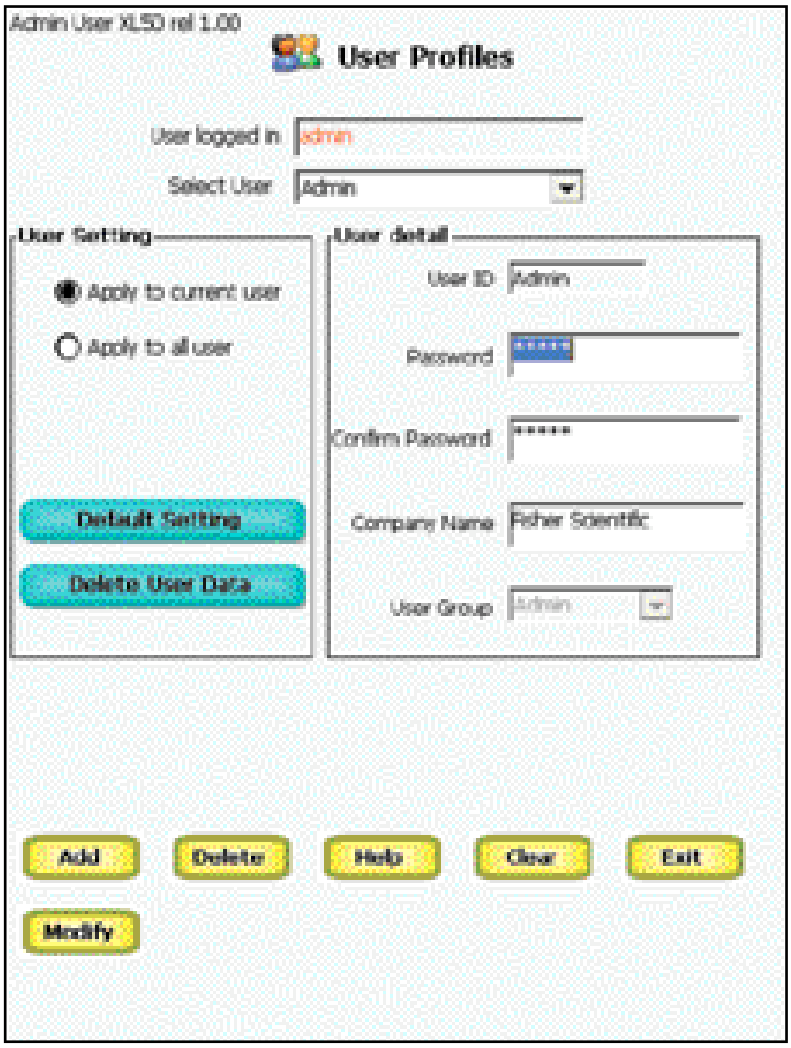


Function Buttons on User Profiles Screen

Touch **Add/Modify** to add or modify the current details.

Touch **Delete** to delete the user, applicable only to the Administrator.

When you touch the **Help** button, information about the current screen appears. This information includes step-by-step instructions for operating the meter from the current screen.

Touch **Clear** to clear all user details.

Touch **Exit** to User Profiles screen.

Touch **Apply to current user** to apply Default Setting or Delete User Data function buttons to current user only.

Touch **Apply to all user** to apply Default Setting or Delete User Data function buttons to all users.

Touch **Default Setting** to reset current or all users to factory default setting of meter

Touch **Delete User Data** to delete all measurement data for current or all users.

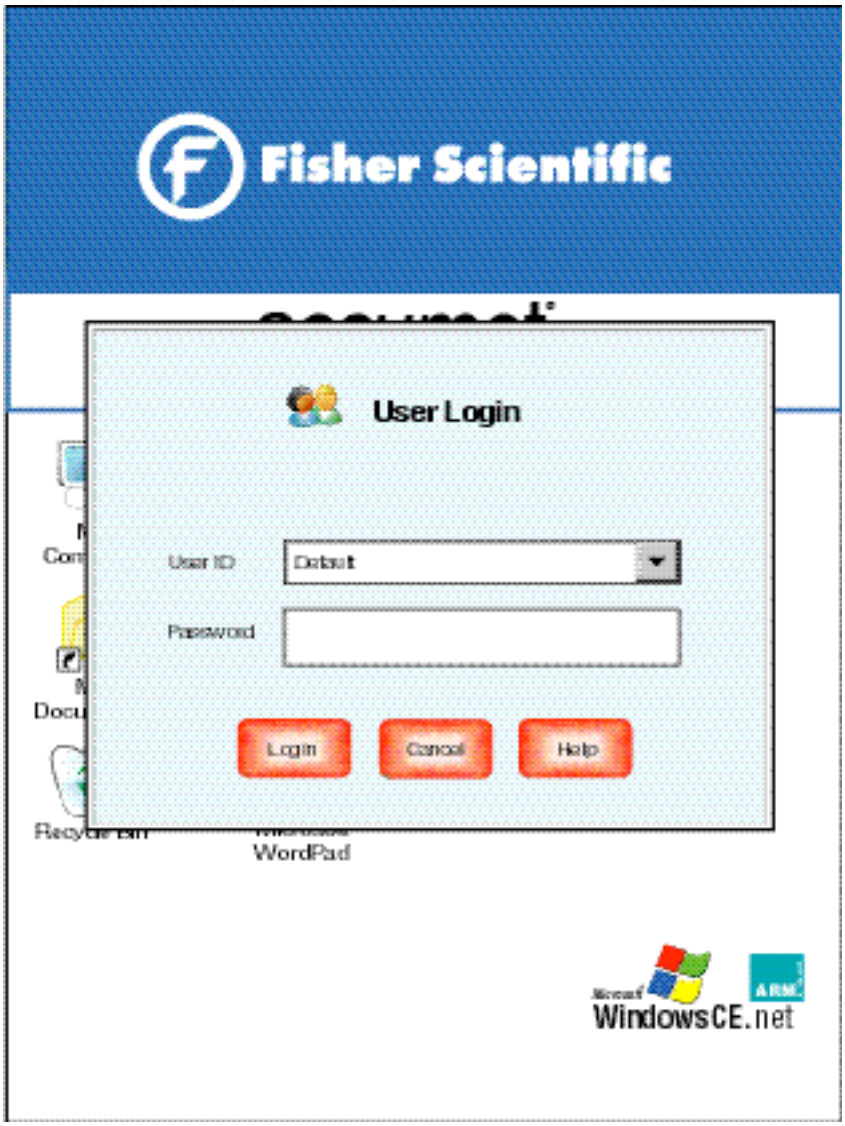
Once you add a User Profile, the **User Login** dialog box will automatically pop-up when you turn on the meter. You must either log in with the correct password or log in as a Default user. The Default user does not require a password.

User Login

1. When the meter is turned on the **User Login** box will appear on the Home screen.
2. Select a **User ID**
3. Touch the **Password** box, use the alphanumeric keypad on the screen to key in the password. The **BS** key will allow you to backspace to remove a character that was incorrectly entered. Press the **Enter** key .

NOTE: If you selected **Default** as a **User ID**, you do not need to enter a password.

4. Touch **Login**, the meter enters the measurement mode.



The following is the list of factory default settings for the XL50 meter. You can reset your meter to the factory default settings by accessing the Reset to Factory Defaults from the System Setup screen.

Screen	Default Setting
For ALL Setup Modes	
Display configuration	All parameters ON
Print configuration	All parameters ON
Data configuration	All parameters ON
Sample ID#	None
Calibration Points	Single Point
Print interval	manual
Stable Indicator	ON
Cell Constant	1.000/cm
Temperature Units	Celsius
Default Temperature	25 degree Celsius
Reference Temperature	25 degree Celsius
Temperature Coefficient	2.100% per degree Celsius
Alarm Limits	OFF
pH Setup Mode	
Display configuration	All parameters ON
Print configuration	All parameters ON
Data configuration	All parameters ON
Buffer Group	USA
Sample ID#	None
Isopotential Point	0 mV
Print interval	manual
Display resolution	X.XX
Auto Buffer Recognition	ON
Auto Read Mode	MANUAL
Temperature Units	Celsius
Default Temperature	25 degree Celsius
Stability Criteria	Fast
Default Slope	Not Applicable
Alarm limits	OFF
Alarm limit low	-2 pH
Alarm limit high	20 pH
mV Setup Mode	
Display configuration	All parameters ON
Print configuration	All parameters ON
Data configuration	All parameters ON
Sample ID#	None
Print interval	Manual
Display resolution	X
mV Readings	Absolute mV
Alarm limits	OFF
Alarm limit low	-2000 mV
Alarm limit high	+2000 mV

Screen	Default Setting
Ion Setup Mode	
Display Configuration	All parameters ON
Print Configuration	All parameters ON
Data Configuration	All parameters ON
Sample ID#	none
Isopotential Point	0 mV
Print Interval	manual
Display Resolution	Three Significant digits
Auto Read Mode	Manual
Temperature Units	Celsius
Default temperature	25.0°C
Stability Criteria	Fast
Default slope	59.16 mV
ISE method	Direct with Standards
Units	ppm
Electrode	Ammonia
Alarm limits	OFF
Alarm limit low	10.00×10^{-7}
Alarm limit high	9.99×10^{10}
Conductivity Setup Mode	
Conductivity Standards	84 uS, 1.413 mS, 12.88 mS, 111.8 mS
Standard Recognition	Auto
Alarm Limit Low	0.00 uS
Alarm Limit High	500000.00 uS
Resistivity Setup Mode	
Alarm Limit Low	3.000 Ohm
Alarm Limit High	100.000 MOhm
TDS Setup Mode	
TDS Factor	0.60
Alarm Limit Low	0.00 ppm
Alarm Limit High	500.00 ppt
Salinity Setup Mode	
Alarm Limit Low	0.000 ppt
Alarm Limit High	90.000 ppt

The isopotential point of an electrode system is the point at which electrode potential is unaffected by a change in temperature. The coordinates of this point would be reported as (pX_{iso} , Eis_0). For an ideal system, this point would be coincident with the system's Zero Potential Point (pX_{iso} , E_0).

In practical systems, however, this coincidence rarely occurs, and for some systems, there is no true Isopotential Point but a general Isopotential area. If a system exhibits an apparent Isopotential Point, or at least an Isopotential area with relatively small spread, Isopotential coordinates may be established and possibly used to some advantage. Isopotential correction may be used only in conjunction with a One- or Two- Point Standardization; it is required only when both accuracy over a significant temperature range as well as operation with an asymmetric electrode system are contemplated. However, Isopotential correction is never necessary if all measurements will be performed on samples which are at similar temperatures. Most conventional pH electrode systems are designed and manufactured to be highly symmetrical cells. Consequently, for most pH work, unless ultimate accuracy over broad temperature ranges is required, Isopotential may be ignored. Specifically, this is accomplished by setting the Isopotential at its reset value of zero millivolts.

The following is an example for determining an Isopotential Point:

Data points are first established for three different standards at three different temperatures. The data points are then plotted and will produce three isotherms which should resemble the plot in either figure 1 or figure 2. In figure 2, the Isopotential Point is well defined as the intersection point of the three Isotherms (pX_{iso} , E_{iso}). The Isopotential Point is not so well defined in figure 1, but a value may be interpolated with some accepted error.

Figure 1

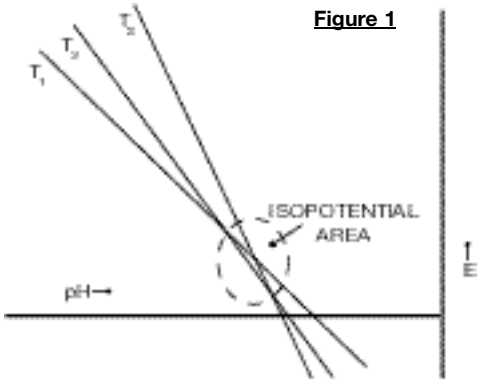
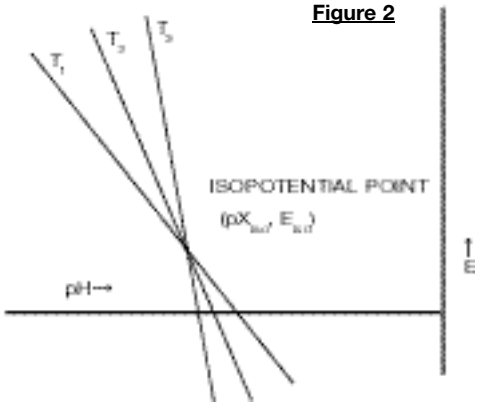


Figure 2



Since its introduction by the Danish chemist Sorensen in 1909, pH measurement has become one of the most commonly used and important measurements in both laboratory and industrial settings. pH measurement and control is vital to a wide array of endeavors including municipal and industrial wastewater treatment, and textile, pharmaceutical, food, and petroleum production. Even our very existence itself is dependent upon pH. Most organisms can exist only within a narrow pH range. In humans, for example, the pH of blood must be maintained within the pH range of 7.3 to 7.4 .

In general, pH is a measure of the degree of acidity or alkalinity of a substance. It is related to the effective acid concentration ("activity") of a solution by this defining equation:

$$pH = -\log aH_3O^+$$

with a H_3O^+ representing the activity or effective concentration of the hydronium ion in solution.

Analysts traditionally work with concentration units rather than activity. Therefore neglecting activity, pH can be defined by the following equation:

$$pH = -\log [H_3O^+]$$

with $[H_3O^+]$ representing the concentration in Moles/liter of the hydronium ion in solution.

The pH range includes values from 0 to 14. Values from 0 to 7 represent the acidic half of the scale. Values from 7 to 14 represent the alkaline or basic half of the scale. The pH value 7 is considered neutral, as it is neither acidic or alkaline.

The pH scale is based on the dissociation constant of water. Water, even in its purest state, dissociates as follows producing a positively charged hydronium ion (H_3O^+) and a negatively charged hydroxyl ion (OH^-):

$$2H_2O = H_3O^+ + OH^-$$

At 25°C in pure water, the concentration of hydronium ions is extremely small, 1 x 10^{-7} Moles/liter, and balanced by an equal concentration of hydroxyl ions. The equilibrium constant, Kw of water is the product of the hydronium ion and hydroxyl ion concentrations:

$$Kw = [H_3O^+]\,[OH^-] = [1x10^{-}7]\,[1x10^{-7}] = 1x10^{-14}$$

Since the hydronium ion concentration is 1 x 10^{-7} Moles/liter, the pH of pure water is 7 , the neutral pH, as stated above:

$$pH = -\log [1 \times 10^{-7}] = 7$$

In aqueous solutions at 25°C, the product $[H_3O^+]\,[OH^-]$ or the Kw of water must remain constant. Therefore, an increase in concentration of either term, $[H_3O^+]$ or $[OH^-]$, will result in a decrease in the other. For example, if a strong base, sodium hydroxide (NaOH) is added to water to the extent that its final concentration is 0.01 Moles/liter, the concentration of the OH^- ion is 0.01 Moles/liter, and the concentration of the H_3O^+ must decrease according to the Kw equation as follows:

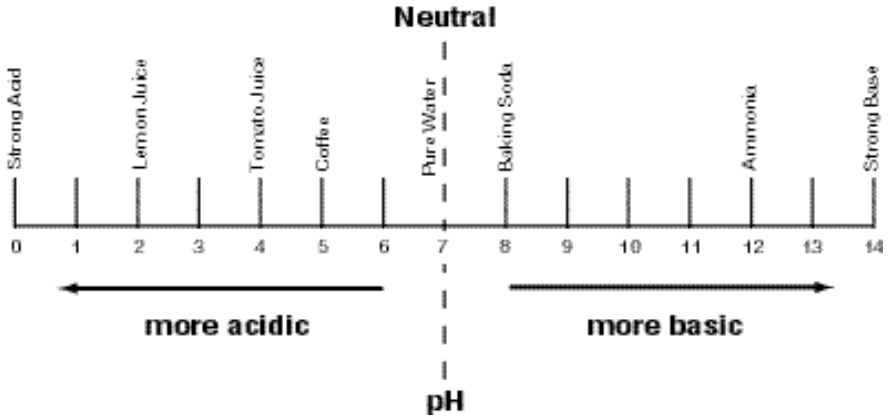
$$[H_3O^+] = Kw/\,[OH^-] = 1 \times 10^{-14} / 1 \times 10^{-2} = 1 \times 10^{-12}$$

The pH of this solution is:

$$pH = -\log [1 \times 10^{-12}] = 12$$

This high pH indicates that the 0.01 M NaOH solution is strongly alkaline; the concentration of hydronium ions is extremely small.

Figure 1



pH Measurement

The pH value of a sample can be determined in several ways. These include the use of organic dyes which change color in certain pH ranges. The dyes can be added directly to the solution or impregnated onto paper which may be dipped into the solution. At best, these "colorimetric" methods yield approximate pH values, often with an accuracy of plus or minus 0.5 pH units.

The preferred and most accurate way to measure a pH value is the potentiometric measurement, using a pH electrode, a reference electrode, and a pH meter. This method is based on the fact that certain electrodes, immersed in solution, produce a millivolt potential (i.e. voltage) that is related to the hydronium ion concentration or pH of a solution in a precise way.

The relationship between the electrode's voltage and the solution pH is defined by the Nernst equation:

$$E_{meas} = E^* - \left(\frac{2.3RT}{nF}\right)(pH)$$

In this equation, Emeas is the voltage output of the electrodes, E* is the total of all other voltages in the system including the reference voltage, R is the Gas Law constant, T is the temperature in °Kelvin, n is the charge on the hydronium ion (+1), and F is the Faraday constant.

pH Meter

The pH meter is a sensitive voltmeter capable of accurately measuring small voltage differences between the pH electrode and the reference electrode. This voltage difference is amplified, and shown as a pH reading. Almost all modern meters are microprocessor controlled, and programmed to use electrode voltages, efficiency, and temperature to calculate an accurate pH for the sample. Since the voltage output from different electrodes will vary, it is essential to calibrate a pH meter. The ability to calibrate or to standardize a pH meter permits the meter to match the pH reading on the meter with the known pH value of a buffer solution. For best accuracy, it is recommended that at least two buffer solutions be used to calibrate a pH meter. Buffer solutions are available as ready-to-use solutions, concentrated solutions, capsules, or prepackaged salts. The following table lists three of the most widely used NIST buffers along with their pH values at different temperatures.

Temperature	4.01	6.86	9.18
0	4.003	6.984	9.464
10	3.998	6.923	9.332
20	4.002	6.881	9.225
25	4.008	6.865	9.180
30	4.015	6.853	9.139
40	4.035	6.838	9.068
50	4.060	6.833	9.011

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pH Electrodes

The electrode system consists of two half cells: a pH indicating electrode, which is primarily responsive to the acidity (the hydronium ion concentration-tion) of a solution, and a reference electrode, which provides a constant voltage and completes the electrical circuit.

Traditional pH indicating electrodes use a tip made of pH sensitive glass. Inside this electrode is a buffer solution with a fixed pH and ionic strength. A silver wire coated with silver chloride is immersed inside this internal solution, and establishes electrical contact between the solution and the meter. The voltage associated with this wire and the voltage associated with the pH of the internal solution and the inside wall of the pH sensitive glass tip remain constant. Therefore, changes in voltage from this electrode result from the voltage developed between the solution and the outside of the glass tip.

If the pH sensitive glass tip or membrane is to function properly, it must be hydrated. A dry or dehydrated electrode membrane will not respond properly to changes in acidity. pH electrodes are also effected by changes in temperature, and the presence of other ions. Temperature effects can be countered by temperature compensation functions on the pH meter. While temperature compensation will not allow you to predict what the pH of the sample is at another temperature, it will permit you to accurately assess the pH at whatever temperature you are presently working. pH sensitive membranes are also sensitive, though to a lesser extent, to other ions than the hydronium ion. For example, most pH glasses are somewhat sensitive to sodium ion as well. For some pH glasses, this means an error as high as 0.5 pH units in highly alkaline, high-sodium solutions. The special FS-5 glass used in Fisher's pH electrodes exhibits much less sodium error in these solutions, <.05 pH units.

Reference electrodes typically consist of three elements: an internal reference electrode, a filling solution, and a reference junction through which the filling solution can "flow", and provide electrical contact with the sample and the internal reference electrode. The most convenient internal reference electrodes are made from a metal (such as silver or mercury) and its sparingly soluble salt (silver chloride or mercurous chloride). The filling solution is most often a concentrated solution of potassium chloride. Most problems with reference electrodes are associated with the interruption or blockage of flow of the potassium chloride fill solution through the reference junction.

The classic electrode pair, separate pH indicating and reference half cells, offer you unmatched versatility to match the needs of your sample. This approach makes for the highest accuracy, as well as low replacement costs, since usually only one of the pair is broken or malfunctioning.

However, the pH indicating half-cell and the reference half-cell can be merged into one electrode - a combination electrode. Combination electrodes are quite popular for they offer distinct advantages in convenience and compactness. Some combination electrodes also incorporate an ATC probe into their body also, providing temperature readout and compensation with meters equipped with these features. Newer combination electrodes are available in which the glass pH membrane sensor has been replaced with a field effect transistor or FET. All of Fisher Scientific's AB, AR and XL meters are capable of using this type of electrode by direct connection (except AB30).

Ion selective electrodes (ISE) respond to ionic activity or concentration in a liquid because of the characteristics of the electrode's sensing membrane. Ideally, the ISE develops an electrical potential which is proportional to the activity or concentration of the ion for which the membrane is selective. For example, the fluoride electrode can be used to directly sense fluoride ion in drinking water. Analyses utilizing ion selective electrodes offer the advantages of speed, ease-of-operation, low cost, and versatility over other analytical techniques. The ISE can measure the ion concentration of samples at very high levels (> 1000ppm) to very low levels (< 1ppm).

When an ISE, the indicator electrode, and a reference electrode are placed in a solution, and connected to a pH/mV/ion meter, they form a potentiometric cell. At equilibrium, the meter measures the potential difference between the ISE and the reference electrode. This millivolt potential is proportional to the activity of the ion of interest, and the relationship is defined by the Nernst equation:

$$E = E^* \pm 2.3 \frac{RT}{nF} (\log a)$$ where

E is the measured potential

E* is the sum of the standard potential and all other constant potentials of the system

R is the gas constant

T is the temperature in °K

F is Faraday's constant

n is the valence of the ion being measured

Activity, a, is not the same as concentration. It is a thermodynamic function whose value is influenced by the ionic environment in which the ion exists. Activity and concentration are the same in very dilute, ideal solutions. In non-ideal solutions, activity and concentration are related by an "activity coefficient".

ISEs sense the activity of free, uncomplexed ions rather than concentration. However, by calibrating the meter with standards with a similar ionic back-ground as the sample, the difference between activity and concentration becomes negligible. Most often this is achieved by adding an ionic strength adjustor to both samples and standards. The Nernst equation becomes:

$$E = E^* \pm 2.3 \frac{RT}{nF} (\log c)$$ where

c is the concentration of the ion of interest.

This form of the Nernst equation states that the electrode potential varies directly with the log of the concentration in straight line manner, and results are then expressed in the preferred concentration units. The slope of the line is equal to the value of :

Slope = S = 2.3RT/nF

The table below gives theoretical slope values at 25°C.

Species	Slope (mV/decade)	Species	Slope (mV/decade)
Monovalent cation	+59.16	Divalent cation	+29.58
Monovalent anion	-59.16	Divalent anion	-29.58

The Nernst equation thus reduces to:

E = E* + S [log c]

Ion-selective Analysis Methods

Direct Analysis

In this method, a sample concentration is determined by measuring the electrode potential and comparing to those obtained in standard solutions. Normally, an ionic strength adjustor and/or pH adjustor must be added to both the samples and the standards. This helps in that the closer the standard solution matrix is to the sample matrix, the more valid is the analysis. A number of standard solutions are used to standardize a pH/mV/ion meter, or to construct a calibration curve (by plotting the electrode's output in mV versus the log of the concentration). The sample concentration is then read from the meter or the calibration curve.

The advantages of the direct method of analysis are:

1. Many samples (particularly those with relatively simple ionic backgrounds) can be quickly measured after a single calibration procedure.

2. The technique is valid over a wide range of concentrations.

3. Sample volume values are not required, and may also vary over a wide range.

Incremental Methods

These procedures can reduce errors caused by temperature variations,complex matrices, and complexation. They are also useful for applications where only occasional samples are analyzed. Incremental methods include: Known Addition, Known Subtraction, Analyte Addition, and Analyte Subtraction.

Known Addition and Known Subtraction

With the Known Addition and Known Subtraction methods, the initial millivolt output of the electrode in the sample solution is measured. Then an aliquot of standard solution is added, and a final millivolt potential is measured. The concentration of the sample can then be computed from the observed change in the millivolt readings before and after the addition. The techniques differ in that with Known Addition the standard added is the same ionic species as that being measured. With Known Subtraction, the measured ion is not the same as the one being added via the standard. For example, a chloride ISE can be immersed in sample for a chloride measurement. If a silver standard is added to the sample, AgCl precipitates, effectively removing or subtracting chloride ion from the sample.

Equations for known addition and known subtraction calculations are as follow:

Known Addition

$$C_s = \frac{C_{std} V_{std}}{(V_s + V_{std})10^{E/S} - V_s}$$

Known Subtraction

$$C_s = \frac{C_{std} V_{std}}{V_s - (V_s + V_{std})10^{E/S}}$$

where

C_S is the concentration of the sample; C_{std} is the concentration of the standard; V_S is the sample volume; V_{std} is the standard volume; E is the difference in millivolt readings from the electrode; and S is the slope of the electrode determined in a previous standardization.

Whereas the direct method is suitable for samples with fairly uncomplicated ionic matrices, the addition methods are advantageous with samples that have complex matrices, samples in which no ISA is added, samples in which excess complexing species are present, and samples whose concentration is in the non-linear region on the electrode response curve.

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Analyte Addition and Analyte Subtraction

In the Analyte methods, the initial millivolt reading is taken with the electrode immersed in the standard; then an aliquot of sample is added, and the final millivolt reading is taken. Sample concentration is calculated from the change in the millivolt readings.

Analyte Addition

$$C_S = C_{std}\left[\left(\frac{V_S + V_{std}}{C_{std}}\right)10^{E/S} - \left(\frac{V_{std}}{V_S}\right)\right]$$

Analyte Subtraction

$$C_S = C_{std}\left[\left(\frac{V_{std}}{V_S}\right) - \left(\frac{V_S + V_{std}}{V_S}\right)10^{E/S}\right]$$

As with known addition, with analyte addition the sample and the standard solution contain the same ion being measured. With analyte subtraction, the ion being measured is in the standard solution, and not in the sample solution. For example, a fluoride standard and a fluoride ISE might be used to measure to aluminum concentration of a sample. When the sample containing aluminum is added to the standard it reduces the measured fluoride content of the standard. The amount of reduction is proportional to the aluminum in the sample.

The analyte methods offer the same advantages as do the addition methods in that they effectively deal with complex samples. A distinct advantage of the analyte subtraction method is that it can be used in cases where an ISE does not exist for a given species, such as aluminum in the example cited.

Replatinization is the process of replacing the platinum on the surfaces of the 2 cell conductivity probes that may flake or wear off over time. The platinum on the surface of the probe is used to increase the surface area of the measuring surface resulting in decreased polarization error. Replatinization is a relatively quick procedure to perform, taking no more than 5 minutes. Although replatinization is not a long process, the replatinization solution is costly. If you are not certain that replatinization will improve the performance of your accumet conductivity probe, please call the technical support hotline at 1-888-358-4706.

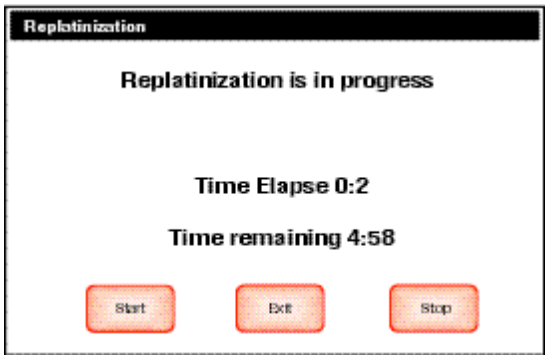
To Perform Replatinization

1. Access the Replatinization mode from the Mode screen. In any measuring mode, touch **Mode** to access the Mode screen.

2. Touch **Replat.** to enter the Replatinization mode.
3. Immerse your 2 cell conductivity probe into the replatinization solution. The immersion depth should be enough to cover the vent holes on the probe.
4. Touch **Start** on the display screen to begin the process of replatinization. At this time a countdown timer will appear on the display screen showing the time elapse and time remaining in the replatinization procedure.

Note: At anytime after you have initiated the replatinization:
You can touch **Stop** to stop the procedure
OR
You can touch **Exit** to cancel the replatinization the procedure and return to the Mode screen.

4-cell conductivity probes do not require replatinization.



Conductance is a quantity associated with the ability of primarily aqueous solutions to carry an electrical current, I, between two metallic electrodes when a voltage E is connected to them. Though water itself is a rather poor conductor of electricity, the presence of ions in the water increases its conductance considerably, the current being carried by the migration of the dissolved ions. This is a clear distinction from the conduction of current through metal, which results from electron transport. The conductance of a solution is proportional to and a good, though nonspecific indicator of the concentration of ionic species present, as well as their charge and mobility. It is intuitive that higher concentrations of ions in a liquid will conduct more current. Conductance derives from Ohms law, E = IR, and is defined as the reciprocal of the electrical resistance of a solution.

C = 1/R C is conductance (siemens)
R is resistance (ohms)

One can combine Ohms law with the definition of conductance, and the resulting relationship is:

C = I/E I is current (amps)
E is potential (volts)

In practice, conductivity measurements involve determining the current through a small portion of solution between two parallel electrode plates when an ac voltage is applied. Conductivity values are related to the conductance (and thus the resistance) of a solution by the physical dimensions - area and length - or the cell constant of the measuring electrode. If the dimensions of the electrodes are such that the area of the parallel plates is very large, it is reasonable that more ions can reside between the plates, and more current can be measured. The physical distance between the plates is also critical, as it effects the strength of the electric field between the plates. If the plates are close and the electric field is strong, ions will reach the plates more quickly than if the plates are far apart and the electric field is weak. By using cells with defined plate areas and separation distances, it is possible to standardize or specify conductance measurements.

Thus comes the term specific conductance or conductivity.

The relationship between conductance and specific conductivity is:

Specific Conductivity, S.C. = (Conductance) (cell constant, k) = siemens * cm/cm^2 = siemens/cm

C is the Conductance (siemens)
k is the cell constant, length/area or cm/cm^2

Since the basic unit of electrical resistance is the ohm, and conductance is the reciprocal of resistance, the basic unit of conductance was originally designated a “mho“ - ohm spelled backwards - however, this term has been replace by the term “siemen“. Conductivity measurements are reported as Siemens/cm, since the value is measured between opposite faces of a cell of a known cubic configuration. With most aqueous solutions, conductivity quantities are most frequently measured in microSiemens per cm (µS/cm) or milliSiemens per cm (mS/cm).

The accumet XL50 meter not only measures conductivity readings from micro or milli Siemens but also reads resistivity (Ohms, kOhms and MOhms), TDS (ppm and ppt), and salinity (ppt).

The salinity scale which ranges from 0 to 90 ppt is a measure of all salts, not just sodium chloride. This scale was originally devised for seawater, and is based on seawater at 15 degrees Centigrade having a conductivity equivalent to that of a potassium chloride solution of a known concentration. This solution (0.44 molal) is defined as having a salinity of 35 ppt.

Note: ppm = parts per million, ppt = parts per thousand, 1000 ppm = 1 ppt

The total dissolved solids scale approximates the ppm TDS in surface waters by multiplying the conductivity of a sample by a factor, 0.66.

Some users prefer the use of resistivity units to describe their water, particularly where high purity water is involved. The unit most often used to describe resistivity is megohm•cm., which ar simple the reciprocal of conductivity (µS/cm). The chart below shows the relationship between these units.

Conductivity, µS/cm	Resistivity, megohm . cm
0.056	18.0
0.1	10.0
1.0	1.0
2.5	0.4
10.0	0.1

Conductivity Measurement

Accumet conductivity electrodes consist of glass or epoxy bodies in which platinum or platinized sensing elements are fixed. Typically, each electrode has two such sensing elements and are designated two-cell electrodes. The previous discussion has focused on this type of electrode. Four cell electrodes are also available, and the theory and application of these are in a separate section.

These sensors contact the solution whose conductivity value is sought. The exact cell constant of the electrode must be determined prior to measuring the sample. In essence, this is accomplished by fixing the nominal cell constant of the electrode into the meter, and recording the observed conductivity value associated with a standard conductivity solution (usually a KCl solution) with a precisely known value. The following calculation yields the actual cell constant.

k = standard value of solution (µS) / observed value of solution (µS)

Fortunately, the accumet XL50 meter automatically does this calculation for you by touching **Standardize**.

To produce an appropriate current signal for the meter it is important to choose an electrode with an appropriate cell constant. The following table lists the optimum conductivity ranges for electrodes with cell constants of 0.1, 1, and 10.

	Optimum Conductivity Range
Cell Constant	2-cell
0.1	0.5 to 200 µS/cm
1.0	0.01 to 2 mS/cm
10.0	1 to 200 mS/cm

Prior to use the electrodes should be conditioned in distilled or deionized water for at least 10 minutes or in accordance with the manufacturer's instructions.

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The four-cell electrode

Traditionally, conductivity measurements were made with a “two cell“ electrode. This electrode used two metallic sensors, and anode and a cathode to which ions migrated. Under the influence of DC current, the electrodes quickly became polarized. In this situation, molecules formed at the electrode surfaces and ions migrating to the area collect around the respective anode or cathode and actually screen it from other ions. In essence the flow of ions stops, and current ceases to flow. Polarization and associated errors can be minimized by using AC voltage, the appropriate cell constant, and a large electrode surface area. The influence of polarization can also be minimized by the use of a four-cell electrode.

The four cell configuration consists of two cells, and outer cell and an inner cell. Voltage is applied to the sensors of the outer cell, which in turn generates a voltage across the sensors of the inner cell. The inner cell is connected to a high impedance circuit and, unlike the outer cell generates no current. Since no current is generated across the inner cell, polarization cannot occur at the inner cell. By measuring the voltage of the inner cell, which is adjusted to match the reference voltage by increasing or decreasing the current through the inner cell, one obtains a true picture of conductivity minus the influence of polarization.

	Optimum Conductivity Range
Cell Constant	4-cell
0.1	Not Available
1.0	0.01 to 20 mS/cm
10.0	1 to 200 mS/cm

Conductivity and Temperature

Conductivity in aqueous solutions reflects the concentration, mobility, and charge of the ions in solution. The conductivity of a solution will increase with increasing temperature, as many phenomena influencing conductivity such as solution viscosity are affected by temperature.

The relationship between conductivity and temperature is predictable and usually expressed as relative % change per degree centigrade. This temperature coefficient (% change per degree) depends on the composition of the solution being measured. However, for most medium range salt concentrations in water, 2% per degree works well. Extremely pure water exhibits a temperature coefficient of 5.2%, and concentrated salt solutions about 1.5%.

Since temperature effects the conductivity measurement so profoundly, the usual practice is to reference the conductivity to some standard temperature. This is typically 25°C, but the XL50 lets the operator select any value between of 15°C and 30°C in the Setup menu option, set Reference Temperature.

The XL50 permits you to enter the temperature coefficient which best suits your sample and use an ATC probe to automatically temperature compensate back to the chosen reference temperature. Refer to the Setup menu option, set Temperature Coefficient.

Replacement Parts

Description	Fisher Catalog Number
accuCap™ refillable electrode, double junction, glass body	13-620-130
Replacement filling solution for 13-620-130 electrode	13-636-430
Accumet pH combination electrode, single junction, Ag/AgCl reference, glass body, BNC connector	13-620-285
ATC Probe	13-620-19
AccuFlex electrode support arm and base	13-637-671
BNC Shorting cap	13-620-99

Accessories

pH Electrode	Fisher Catalog Number
accuCap Glass Body Gel-Filled pH Combination Electrode	13-620-131
accuCap Plastic Body Gel-Filled pH Combination Electrode	13-620-132
accuCap Glass Body Spear Tip pH Combination Electrode	13-620-133
accumet 3-in-1 pH/ATC combination electrode, single junction, Ag/AgCl reference, epoxy body, BNC connector	13-620-530
accumet 3-in-1 pH/ATC combination electrode, Tris-compatible, calomel reference, epoxy body, BNC connector	13-620-531
accuFet XL cone-tip electrode	13-620-700
accuFet XL cup-tip electrode	13-620-710
accuFet XL flat-tip electrode	13-620-720
accuFet XL lance-tip electrode.	13-620-730

Calibration Certificate	Fisher Catalog Number
NIST pH meter calibration certificate	15-094-28

pH Buffers and Solutions

pH	Color	Description / Ingredients	Size	Fisher Catalog Number
4.00	Red	Potassium Biphthalate	500 mL	SB101-500
7.00	Yellow	Potassium Phosphate Monobasic	500 mL	SB107-500
10.00	Blue	Potassium Carbonate, Potassium	500 mL	SB115-500
4.00		Individual Tear open pH Packets	20/box	13-300-150
7.00		Individual Tear open pH Packets	20/box	13-300-149
10.00		Individual Tear open pH Packets	20/box	13-300-148

Fisher BufferPac® (pH 4.00, 7.00, and 10.00 buffers), 3 x 500 mL SB105

Individual Tear open pH Packets assortment (5 each of pH 4.00, 7.00, 10.00 and rinse packets), 20/box 13-300-147

Electrode Rinse Individual Tear open pH Packets, 20/box 13-300-180

Electrode storage solution, 1 L SE40-1

To place an order, call 1-800/766-7000, fax 1-800/926-1166, or online www.fishersci.com

Replacement Parts

Description	Fisher Catalog Number
Conductivity probe storage solution. Keeps probes ideally conditioned and ready for use	09-330-1

accumet Immersion Type Conductivity Electrodes

	2 Cell Conductivity Cell		4 Cell Conductivity Cell	
Cell constant	Glass Body	Epoxy Body	Glass Body	Epoxy Body
0.1 cm^{-1}	—	13-620-101	—	—
1.0 cm^{-1}	—	13-620-100	13-620-163	13-620-165
10.0 cm^{-1}	—	13-620-102	13-620-164	13-620-166

accumet Conductivity Calibration Standards

Conductivity	Resistivity	Dissolved Solids	16 oz bottle	100mLx6 bottles
10 µmhos	0.1 megohms	6.6 ppm	09-328-1	09-328-6
100 µmhos	0.01 megohms	66 ppm	09-328-2	09-328-7
1000 µmhos	0.001 megohms	660 ppm	09-328-3	09-328-8
1413 µmhos	0.0007 megohms	933 ppm	09-328-11	09-328-12
10,000 µmhos	0.0001 megohms	6600 ppm	09-328-4	09-328-9
100,000 µmhos	0.00001 megohms	66,000 ppm	09-328-5	09-328-10

To place an order, call 1-800/766-7000, fax 1-800/926-1166, or online www.fishersci.com

For a complete selection of electrodes and accessories, please refer to the Fisher 2004/05 Catalog, or contact your Fisher Scientific sales representative.

Note: For electrochemistry technical support, call 1-888/358-4706, fax 1-847/327-2987, or e-mail techinfo@fisherelectrochemistry.com.